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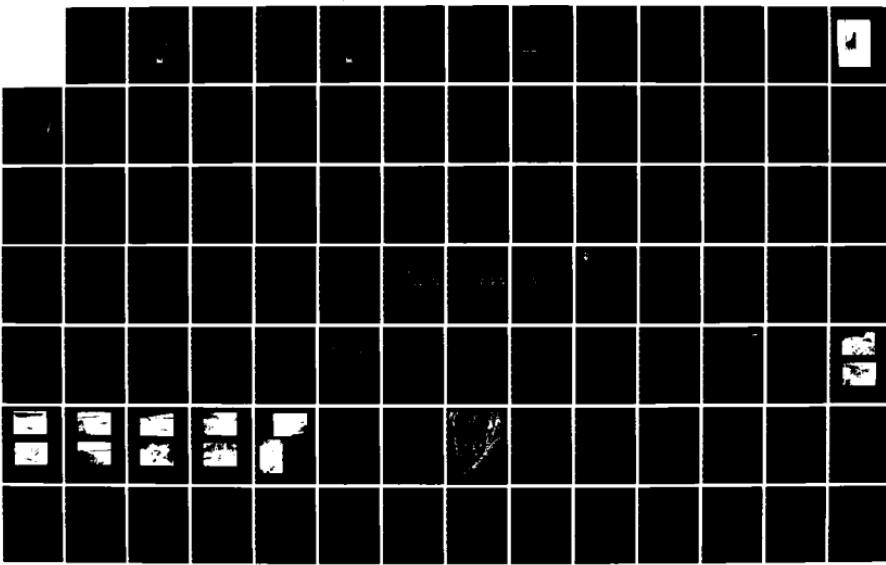
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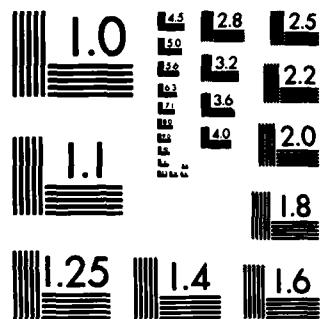
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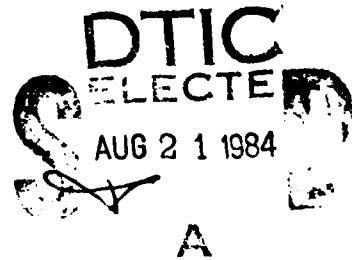
**SHETUCKET RIVER BASIN
WILLINGTON, CONNECTICUT**

**HALCHEK POND DAM
CT 00677**

**PHASE 1 INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM**

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**DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.**

MARCH 1981

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER CT 00677	2. GOVT ACCESSION NO. ADA144582	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Halchek Pond Dam	5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT	
NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION	8. CONTRACT OR GRANT NUMBER(s)	
9. PERFORMING ORGANIZATION NAME AND ADDRESS	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS	
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18. SUPPLEMENTARY NOTES Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) DAMS, INSPECTION, DAM SAFETY, Shetucket River Basin Willington, Connecticut		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Halchek Pond Dam is an earth embankment, approximately 18 ft. wide at the crest, 760 ft. long and 26 ft. high above the stream bed. The dam is considered to be in FAIR condition. The dam is classified as SMALL in size and as having a SIGNIFICANT hazard potential. The test flood for this dam is $\frac{1}{2}$ the PMF.		



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:

NEDED

JUL 23 1981

Honorable William A. O'Neill
Governor of the State of Connecticut
State Capitol
Hartford, Connecticut 06115

Dear Governor O'Neill:

Inclosed is a copy of the Halchek Pond Dam (CT-00677) Phase I Inspection Report, prepared under the National Program for Inspection of Non-Federal Dams. This report is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. I approve the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is vitally important.

Copies of this report have been forwarded to the Department of Environmental Protection, and to the owner, Mr. Joseph Halchek, Stafford Springs, CT. Copies will be available to the public in thirty days.

I wish to thank you and the Department of Environmental Protection for your cooperation in this program.

Sincerely,

C. E. EDGAR, III
Colonel, Corps of Engineers
Commander and Division Engineer

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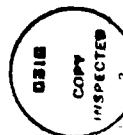
**SHETUCKET RIVER BASIN
WILLINGTON, CONNECTICUT**

**HALCHEK POND DAM
CT 00677**

**PHASE 1 INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM**

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**DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.**

MARCH 1981

NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

Identification No.: CT 00677
Name of Dam: Halchek Pond Dam
Town: Willington
County & State: Tolland, Connecticut
Stream: Keene Brook
Owner: Joseph Halchek
Date of Inspection: 11 December 1980

BRIEF ASSESSMENT

Halchek Pond Dam is an earth embankment, approximately 18 feet wide at the crest, 760 feet long and 26 feet high above the stream bed. Both the upstream and downstream slopes are approximately 1V:4H. A reinforced concrete spillway is located at the left abutment and is designed to support a bridge. An emergency spillway is located at the right abutment and consists only of an open earth cut. The crest of this emergency spillway has been raised approximately one foot with loosely placed earth fill, and flashboards have been installed on the reinforced concrete spillway to raise the water level in the pond. The outlet works consist of a high level and a low level outlet. The low level outlet is a box culvert passing through the approximate center of the dam, with a gate structure built as a drop inlet on the upstream end. The high level outlet consists of a 6 inch diameter pipe traversing the dam near the right abutment with a gate valve on either side of the crest.

The dam was constructed on Keene Brook, which is a tributary to the Willimantic River. The maximum storage capacity of the reservoir is 154 acre feet and its drainage area is 1.55 square miles. Design of the dam was started in 1955 and plans were approved the following year. Construction did not, however, take place until 1970. It was constructed to provide recreational facilities for camping and related activities.

As a result of the visual inspection, hydrologic and hydraulic computations and the review of data available, the dam is considered to be in FAIR condition. To assure the long term performance of this structure, the following items of concern require attention: the extensive seepage observed downstream of the dam could represent a threat of piping under unfavorable foundation soil conditions; the emergency spillway channel may direct flow against the downstream toe, which could result in erosion of the dam; the construction method of the emergency spillway is inadequate; and the growth of small trees on the upstream slope could cause increased seepage in the future.

The dam is classified as SMALL in size and as having a SIGNIFICANT hazard potential, in accordance with the recommended guidelines established by the Corps of Engineers.

The test flood for this dam is one-half the Probable Maximum Flood ($\frac{1}{2}$ PMF). This test flood has a maximum inflow of 1,650 cfs and an outflow discharge equal to 1,620 cfs, which will not overtop the dam. The maximum outflow capacity of the primary spillway and emergency spillway when water level is at the top of the dam is 1,840 cfs, which represents approximately 112% of the test flood.

It is recommended that the Owner retain the services of a registered professional engineer to assess the need for reconstructing or improving the emergency spillway and providing cover for the discharge channel, to evaluate the significance of seepage observed along the toe of the dam, and to prepare recommendations as discussed in Section 7 of this report. The Owner should also remove the existing flashboards from the primary spillway. If a higher water level is to be maintained by flashboards, a full hydrologic and hydraulic study, with recommended improvements, should be made by an engineer prior to their installation.

The above recommendations and any further remedial measures which are discussed in Section 7 should be instituted within one year of the owner's receipt of this report.

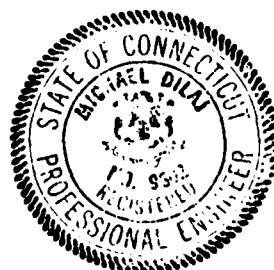
LENARD & DILAJ ENGINEERING, INC.

By: John F. Lenard

John F. Lenard, P.E.

President

Michael Dilaj
Michael Dilaj, P.E., Vice President
Project Manager



This Phase I Inspection Report on Halchek Pond Dam (CT-00677) has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgement and practice, and is hereby submitted for approval.

Carney M. Terzian

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

Joe Finegan

JOSEPH W. FINEGAN, JR., MEMBER
Water Control Branch
Engineering Division

Aramast Mahtesian

ARAMAST MAHTESIAN, CHAIRMAN
Geotechnical Engineering Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation. However, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions will be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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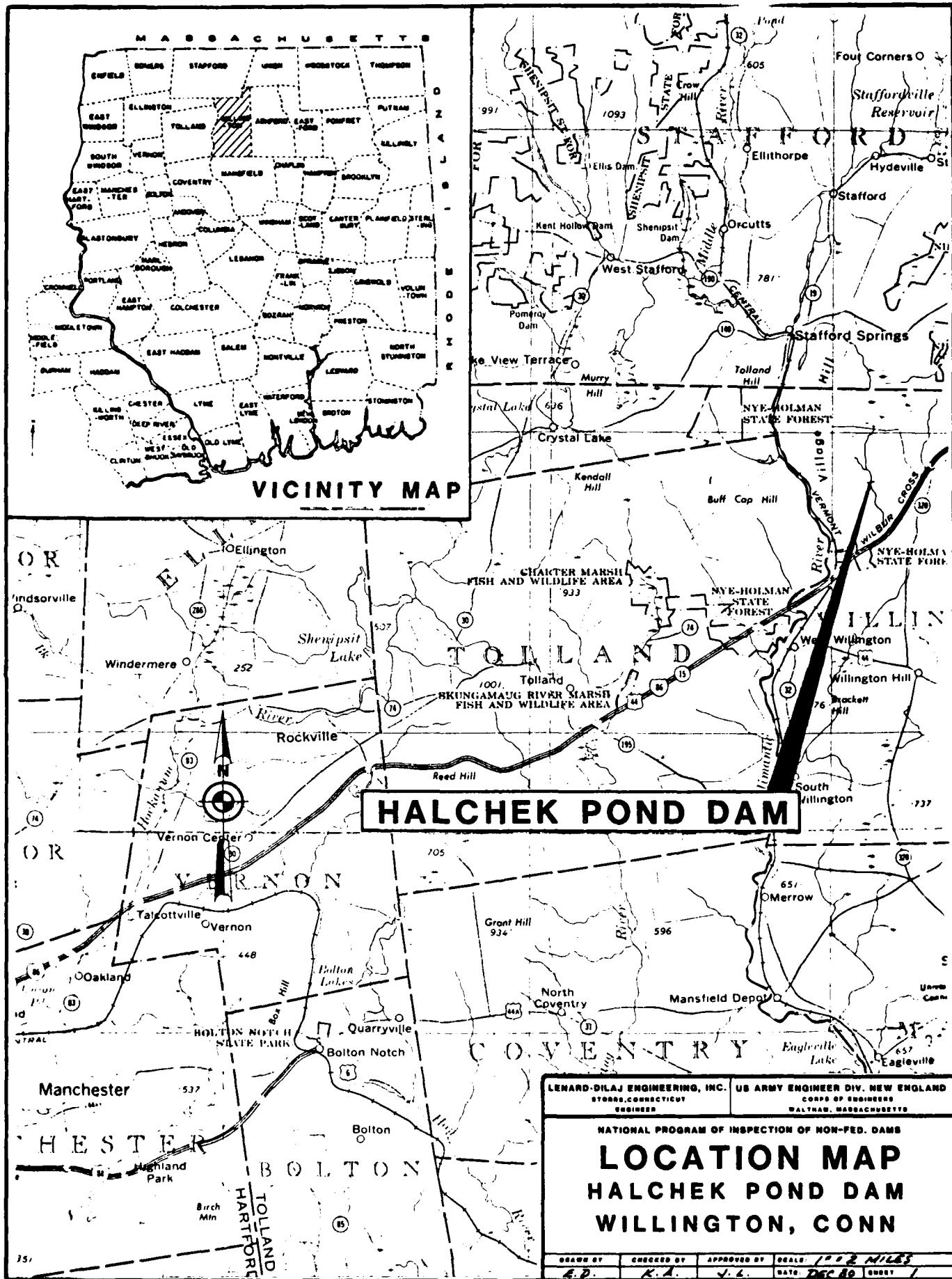
**APPENDIX E - INFORMATION AS CONTAINED IN THE
NATIONAL INVENTORY OF DAMS**



OVERVIEW PHOTO

TAKEN 11 DECEMBER 1980

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	HALCHEK POND DAM WILLINGTON, CONNECTICUT CT 00677 JAN. 1981
LENARD-DILAJ ENGINEERING, INC. STORRS, CONNECTICUT Engineer		



PHASE I INSPECTION REPORT

SECTION I - PROJECT INFORMATION

1.1 General:

- a. Authority: Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Lenard & Dilaj Engineering, Inc. has been retained by the New England Division to inspect and report on selected dams in the States of Connecticut and Rhode Island. Authorization and notice to proceed were issued to Lenard & Dilaj Engineering, Inc. under a letter of 6 November, 1980 from William E. Hodgson, Jr., Colonel, Corps of Engineers. Contract No. DACW33-81-C-0014 has been assigned by the Corps of Engineers for this work.
- b. Purpose of Inspection Program: The purposes of the program are to:
 1. Perform technical inspection and evaluation of non-federal dams to identify conditions requiring correction in a timely manner by non-federal interest.
 2. Encourage and prepare the states to quickly initiate effective dam inspection programs for non-federal dams.
 3. To update, verify and complete the National Inventory of Dams.
- c. Scope of Inspection Program: The scope of this Phase I inspection report includes:
 1. Gathering, reviewing and presenting all available data as can be obtained from the owners, previous owners, the state and other associated parties.
 2. A field inspection of the facility detailing the visual condition of the dam, embankments and appurtenant structures.

3. Computations concerning the hydraulics and hydrology of the facility and its relationship to the calculated flood through the existing spillway.
4. An assessment of the condition of the facility and corrective measures required.

It should be noted that this report does not pass judgment on the safety or stability of the dam other than on a visual basis. The inspection is to identify those features of the dam which need corrective action and/or further study.

1.2 Description of the Project:

- a. Location: The project is located on Keene Brook, a tributary to the Willimantic River, which is located approximately 2 miles downstream from Halcheck Pond Dam. The pond and dam are located in the Town of Willington, County of Tolland, and State of Connecticut. The dam itself is located just north of I-86, and is shown on the Stafford Springs, Connecticut USGS quadrangle map, having coordinates $41^{\circ} 55' 06''$ (north latitude) and $77^{\circ} 16' 46''$ (west longitude).
- b. Description of Dam and Appurtenances: Halcheck Pond Dam is an earth embankment dam approximately 760 feet long and 26 feet high, with a crest width of about 18 feet. The typical slope both upstream and downstream is about 1V:4H. An unpaved roadway runs along the top of the dam for its entire length. At the left abutment and near the primary spillway, the road passes through the spillway's discharge channel (see Overview Photo). The Owner has planned for a future bridge to pass over the spillway so that the road does not pass through the discharge channel.

There are two spillways at the Halcheck Pond Dam, a primary at the left abutment and an emergency at the right abutment. The primary spillway is a reinforced concrete structure 20.4 feet wide and 6.4 feet high. Two flashboards were recently installed at this spillway to temporarily raise the water level in the pond by 2 feet. The discharge channel from the primary spillway is a rough cut and unstabilized channel through the original soil materials of the left abutment. The emergency spillway, located at the right abutment, consists of a low area in the fill material for the dam. It is approximately 30 feet wide at its base with 20 foot long side slopes. Loose fill material was recently placed in this spillway to prevent water from passing

through, after flashboards had been placed in the primary spillway. The discharge channel from the emergency spillway passes through the embankments of the dam and is also unstabilized. In addition, discharge through the emergency spillway would pass very close to the toe of the dam, where some erosion is already apparent.

There are two operational and regulated outlets at this dam, a high level outlet near the right abutment and a low level outlet through the center of the dam. The high level outlet is a 3 inch diameter pipe with two gate valves, one on the upstream embankment and one on the downstream embankment. The upstream end of the pipe is submerged beneath the pond, while the downstream end is a free discharge approximately 10 feet above ground level. This is to facilitate the filling of tank trucks with water from the pond (Photo 7). The low level outlet consists of an upstream inlet and a reinforced (2' x 2') concrete box culvert which passes beneath the dam. The inlet is a square (5' x 5') reinforced concrete structure approximately 50 feet into the pond as measured from the upstream side of the dam crest. Water level in the pond is normally controlled by the primary spillway, but if the level rises, water passes over the inlet structure and through the low level outlet. Because the inlet structure for the low level outlet also has a sluice gate (2' x 2', approximate invert 648 feet), the water level in the pond can be controlled and lowered when necessary.

- c. Size Classification: With the pool level at the top of the dam, the height of the dam is 26 feet and the impoundment capacity is 154 acre feet. In accordance with the guidelines of the Corps of Engineers, which indicate that a height of 25-39 feet and an impoundment capacity of 50-999 acre feet is considered small the dam is classified as SMALL in size.
- d. Hazard Classification: The dam is classified as having a SIGNIFICANT hazard potential because it is located in a rural area where the failure discharge could cause damage due to high velocity, impact from debris and flooding. One residential house, a road (Kucko Road) and public utilities adjacent to the road would be damaged with a possible loss of a few lives at the house location. Estimated water depths due to the dam failure discharge of 49,500 cfs would be approximately 13 feet near the crossing of Kucko Road, 1,650 feet downstream of the dam. This represents an increase of 6 feet in the level of the water in the stream channel from the pre-failure depth of 7 feet. While there would be no flooding at the house near Kucko Road prior to failure, post-failure depths at the house would be at least 2 feet above the sill elevation.

- e. Ownership: Halchek Pond Dam is owned by Mr. Joseph Halchek, 188 Village Hill Road, Stafford Springs, Connecticut 06076, telephone (203) 684-3610
- f. Operator: The facilities are operated by Mr. Joseph Halchek, 188 Village Hill Road, Stafford Springs, Connecticut 06076, telephone (203) 684-3610.
- g. Purpose of Dam: The facility will be used as a recreation area for a campground and related activities. The commercial campground has not yet been placed in operation, although plans have been formulated for construction to begin in the near future.
- h. Design and Construction History: Construction took place between 1970 and 1972, based on plans prepared by Stanley Allen, P.E. of Danielson in 1955 and 1956. The plans consisted of approximate sketches which were not followed during the construction and for this reason have not been included in this report. The exact location of the dam, the makeup of the core wall, the typical cross-section and most other details were changed during the construction. The State of Connecticut inspected the facility and issued a permit. After this inspection, the flashboards were installed to raise the pond elevation. The emergency spillway was also raised.
- i. Normal Operating Procedures: Normally the pond level is kept 2 feet above the spillway crest elevation by flashboards and the gate on the outlet structure is kept closed. A limited amount of water is withdrawn from the pond by the high level outlet for filling water tank trucks. Reportedly, the pond elevation has never risen more than 6 inches above the flashboards.

1.3 Pertinent Data:

- a. Drainage Area: Halchek Pond Dam is located in the Town of Willington in the north central portion of Connecticut. The drainage basin is generally irregular in shape with a length of approximately 1.5 miles along its north-south axis and a width of 1 mile. The total drainage area is 1.55 square miles. The topography consists of moderately rolling terrain with elevations ranging from a high of 840 feet at the northwest boundary to 668 feet at the spillway crest.

b. Discharge at Damsite: No discharge records are maintained at this facility. Two flashboards were in place on the spillway crest at the time of inspection, raising its elevation by 2 feet. It should be noted, however, that normal pool elevation is maintained at the crest elevation of the spillway, without any flashboards in place. Discharges shown below are, therefore, calculated on the assumption that the spillway crest is at normal elevation with no flashboards in place. Also, ungated spillway capacities include those of both the primary and emergency spillways. Because the capacity of the 3 inch diameter discharge on the high level outlet would be minimal, its contribution to the total capacity of the dam was not considered in this section.

1. Outlet Works (Low Level):

Size	2'x 2' concrete conduit
Invert Elevation	647.9
Discharge Capacity	130 cfs (at top of dam level)

2. Maximum known flood at dam site: Discharge unknown

3. Ungated spillway capacity at top of dam: 1,840 cfs at Elev. 674.4

4. Ungated spillway capacity at test flood elevation: 1,480 cfs at Elev. 673.9

5. Gated spillway capacity at normal pool elevation: N/A

6. Gated spillway capacity at test flood elevation: N/A

7. Total spillway capacity at test flood elevation: 1,480 cfs at Elev. 673.9

8. Total project discharge at top of dam: 1,970 cfs at Elev. 674.4

9. Total project discharge at test flood elevation (below top of dam): 1,620 cfs at Elev. 673.9

c. Elevations (Feet above National Geodetic Vertical Datum) :

1. Streambed at toe of dam:	647.9
2. Bottom of cutoff:	Unknown
3. Maximum tailwater:	Unknown
4. Normal pool (no flashboards):	668.0
5. Pool at top of flashboards:	670.0
6. Full flood control pool:	N/A
7. Spillway crest:	668.0
8. Design surcharge (original design):	N/A
9. Top of dam:	674.4
10. Test flood surcharge:	673.9

d. Reservoir (Length in Feet) :

1. Normal pool:	1,600
2. Flood control pool:	N/A
3. Spillway crest pool:	1,600
4. Top of dam:	1,700
5. Test flood pool:	1,700

e. Storage (Acre-feet) :

1. Normal pool:	81
2. Flood control pool:	N/A
3. Spillway crest pool:	81
4. Top of dam:	154
5. Test flood pool:	147

f. Reservoir Surface (Acres) :

1. Normal pool:	9
-----------------	---

2. Flood control pool: N/A
 3. Spillway crest: 9
 4. Test flood pool: 13
 5. Top of dam: 14
- g. Dam:
 1. Type: Earth embankment
 2. Length: 764 feet
 3. Height: 27 feet
 4. Top width: 18 feet
 5. Side slopes: 1V:4H
 6. Zoning: Unknown
 7. Impervious core: Unknown
 8. Cutoff: Unknown
 9. Grout curtain: Unknown
- h. Diversion and Regulating Tunnel: N/A
- i. Spillway:

	<u>Primary</u>	<u>Emergency</u>
1. Type:	Broad crest reinf.conc.	Broad crest earth fill
2. Length of weir:	20.4 feet	30 feet
3. Crest elevation (without flashboards):	668.0	670.3
4. Gates:	Flashboards	None
5. U/S channel	Natural bed	Natural bed
6. D/S channel	Natural bed	Natural bed

j. Regulating Outlets:

1. Low level:

a. Invert: 647.9 feet
b. Size: 2' x 2'
c. Description: Reinforced concrete box culvert passing beneath center of dam.
d. Control mechanism: Intake structure on upstream side acting as overflow spillway at Elev. 670.9. Structure has low level gate to drain pond if necessary.

2. High level:

a. Invert: 667.6 feet
b. Size: 6" diameter pipe with 3" diameter outlet.
c. Description: The 6" diameter pipe is a steel well casing which is reduced to a 3" diameter outlet at the discharge point.
d. Control mechanism: There are two 6" gate valves on the 6" pipe and a 3" valve at the discharge point.

SECTION 2
ENGINEERING DATA

- 2.1 Design: Halcheck Pond Dam was designed by Stanley L. Allen of Peckham Lane, Danielson, Connecticut, Professional Engineer No. 1959. Mr. Allen prepared preliminary plans during 1955 and obtained approval for these from the State Water Resources Commission. Specifications and those plans which were used for construction are reproduced in the Appendix. Most of the construction plans and specifications, however, were not followed during the construction of the facility. The location of the dam, the material makeup, and the cross-sectional area were all somewhat changed.
- 2.2 Construction: The dam was constructed by the present owner between the years of 1970 and 1972. Adjacent to the left abutment of the dam there is an indication of the type of material used for building the dam. It consists of an open face cut into an embankment of well graded gravel and sandy material.
- 2.3 Operation: No formal records of operation are maintained for this facility. According to the owner, the spillway capacity has never been exceeded. The water level is normally kept at spillway elevation and a very limited amount of water is withdrawn from the high level overflow near the right abutment. The low level outlet conduit is used only intermittently to drop the water level.
- 2.4 Evaluation:
- a. Availability: Existing data was provided by the State of Connecticut Water Resources Unit and by the owner. As indicated before, the design was not closely followed.
 - b. Adequacy: The limited amount of engineering data available was generally inadequate to perform an in-depth structural assessment of the dam particularly since plans did not agree with final construction. Therefore, the final assessment of this dam must be based primarily on the visual inspection, past performance history, hydraulic computations of spillway capacity and hydrologic calculations. Any structural evaluation must be based on actual information on the material makeup of the dam and water level elevations within the dam.
 - c. Validity: Due to the lack of available data the conclusions and recommendations found in this report are based on the visual inspection and hydraulic/hydrologic computations.

SECTION 3

VISUAL INSPECTION

3.1 Findings:

- a. General: An inspection of Halchek Pond Dam was performed on December 11, 1980 by Lenard & Dilaj Engineering, Inc., with the assistance of the owner, Mr. Halchek. The temperature on this day was 25°F, the weather was clear and sunny and the ground was clear of snow.

As a result of the visual inspection, a review of the history, and general appearance, the dam at Halchek Pond and its appurtenances are judged to be in FAIR condition. The embankments are basically covered with grass. There are, however, numerous saplings growing on the upstream embankment and there is also some tree growth started on the downstream slope. The extensive seepage observed along the entire downstream toe of the dam could represent a threat of piping under unfavorable foundation soil conditions. There is no toe drain along the downstream slope and records are not kept of the seepage. The emergency spillway channel may direct flow against the downstream toe of the dam, which could cause erosion of the toe and eventual deterioration of the dam. The intake structure for the low level outlet lacks a trash rack and requires a bridge for access.

At the time of inspection, the water level in the reservoir was approximately 2 feet above spillway crest elevation due to flashboards set in the principal spillway.

The dam is operated by the owner who lives only a short driving distance from the site.

- b. Dam: The dam is an earth embankment type structure. Design sketches are available; however, the actual construction did not coincide with these original plans. The dam was designed in 1955 and the construction took place between 1970 and 1972. Flashboards were installed recently and the bridge over the spillway is still not completed.

1. Crest: An unpaved roadway runs along the crest of the dam (See Photo 6). Some grass covers the crest, particularly the untravelled sections. The bridge across the spillway is incomplete (Photo 1) and the roadway passes below the spillway, where it traverses the spillway discharge channel (See Site Plan). Along the right abutment, the roadway traverses the discharge channel of the emergency spillway just south of the spillway crest.

2. Upstream slope: The upstream slope of the dam is protected by large size riprap below the present water level in the reservoir. Smaller riprap, up to 9" in size, covers portions of the upstream slope above the present reservoir elevation. No riprap is present at the sandy beach area just to the right of the principal spillway. Small trees are growing near the water line on the upstream slope (Photos 5 & 6). There is grass cover along the entire exposed upstream slope (Photo 6). The slope of the embankment is approximately 1V:4H. It is in generally good condition along the entire length of the dam.
 3. Downstream slope: The downstream slope of the dam is covered with grass (Photo 7). Extensive seepage occurs at the toe of the downstream slope along the entire length of the dam. Because seepage emanating from the dam was basically groundwater coming out over a wide area, no estimate of the quantity could be established at this time. Flowing water, rust colored deposits, and an oily sheen were observed at seepage areas. No soil transportation was observed. The seepage occurs over a broad area downstream of the right side of the dam (Photos 11 & 12) and on the left side of the dam between the toe of the downstream slope and the principal spillway channel, where it becomes ponded in two areas (Photo 9 & 10). There is a gravel surfaced loading area for water tank trucks near the right abutment below the high level outlet (Photo 7). On the left side of the downstream slope there are a number of large stones and boulders deposited at a certain location, where there is apparent seepage beneath the stones. Indications are that these boulders and stones were moved to the area during the construction of the dam (Photo 9).
- c. Appurtenant structures: Appurtenant structures for this dam are the primary spillway, the emergency spillway and the high and low level outlets.
1. Primary overflow spillway and spillway approach channel: The primary concrete spillway is located near the left side of the crest. A design sketch for this facility is included in the appendix. It should, however, be noted that construction did not follow the design sketch exactly. The two

reinforced concrete training walls appear in good condition, with no evidence of concrete deterioration or seepage (Photo 1). The training walls are designed to serve as abutments for a bridge deck to be erected at a later date. In the photo one can note uncut tie rods at the surface and a line showing the different pours of concrete. Two 12" flashboards can be seen in the picture. These flashboards raise the reservoir level approximately 2 feet above the elevation of the primary spillway crest. There are no weep holes on the training walls and there is no indication of any drainage pipe behind the training walls. The channel immediately downstream of the spillway is relatively flat and is presently used in traversing the brook with vehicles. After this section, the channel is quite steep and is covered with numerous boulders (Photos 1 & 2). There appears to be extensive erosion between the boulders.

2. Emergency spillway: The emergency spillway consists of an open cut at the right abutment (Photo 3). The crest of this spillway has been raised recently with approximately 1.5 feet of uncompacted and very loose earth fill. At the time of inspection, the lowest point of the emergency spillway crest was approximately one-half foot above water level and appeared to be quite saturated. The downstream channel of the emergency spillway is poorly defined and discharge from the pond could flow against the downstream toe of the dam. Also, if water were to flow in the emergency spillway for an extended period of time, extensive erosion would occur.
3. Low level outlet works: The low level outlet works consist of a conduit passing through the approximate center of the dam and an upstream gated intake structure. The gate structure and the downstream end of the conduit are in generally good condition (Photos 5 & 8). Some efflorescence and minor seepage were noted in the gate structure, particularly along construction joints. The gate structure also performs as a drop inlet auxiliary spillway, since the top of the structure is below the crest of the dam. However, it lacks a trash rack to prevent floating debris from falling into the structure. There is a

sluice gate installed at the bottom of this reinforced concrete chamber. It is situated on the upstream side of the chamber and has holes punched in it to provide and maintain a minimum flow to the stream during dry periods for environmental purposes. Because there are no steps to provide access to the bottom of the chamber, no close visual inspection of the gate could be made. The service bridge to the gate structure rests on 4" diameter galvanized steel piles (Photo 5). The decking, however, consists only of loose oak planks.

4. High level outlet: The high level outlet is located near the right abutment of the dam (See Site Plan). It consists of a 6" diameter well-casing with two valve chambers installed during the construction of the dam. Both gate mechanisms are in good operating condition. The 6" diameter well casing is reduced on the downstream side to a 3" diameter pipe with an attachment to allow the owner to draw water from the lake and fill water trucks (Photo 7). The gate valves are accessible from the surface of the dam by vertical 30" diameter concrete pipes (well-tiles). There is no outlet channel for the high level outlet, since it is used only for filling water trucks.
 - d. Reservoir area: There are no signs of instability along the edge of the reservoir in the vicinity of the dam. A borrow area used for the construction of the dam can be seen near the edge of the reservoir, upstream of the left embankment (Photo 4). It consists of fine gravelly sand with about 10% silt and random cobbles and boulders.
 - e. Downstream channel: The downstream channel is the natural stream bed and adjacent wetland areas. Stream banks are covered with trees and brush.
- 3.2 Evaluation: Based on the visual inspection, the overall condition of the dam appears to be FAIR. Features which could potentially affect the integrity of the dam are:
- a. The extensive seepage observed downstream of the dam, which could represent a threat of piping under unfavorable foundation soil conditions; i.e., if the foundation soils consist of silts or other soils susceptible to piping.

- b. The emergency spillway channel, which could direct flow against the downstream toe and thereby result in erosion of the dam. Also, the emergency spillway was saturated, making it susceptible to failure by erosion.
- c. The growth of small trees on the upstream slope, which if unchecked, could cause increased seepage in the future along the decaying roots.
- d. The lack of a stabilizing cover on the crest of the dam and the diversion of the road through the spillway discharge channel, both of which could lead to erosion of the dam embankments.
- e. The lack of a trash rack over the drop inlet for the low level outlet to prevent floating debris from falling into the structure.

SECTION 4

OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures:

- a. General: Halchek Pond Dam was designed to be used as a recreational facility for a campground. It is not yet in operation, and is used only privately. The reservoir level is kept 2 feet above spillway crest with flashboards most of the time. The pond level can be lowered through the discharge conduits. Water is also used for filling water tanktrucks at the area shown in Photo 7.
- b. Description of Any Warning System in Effect: There are no written emergency procedures or warning systems in effect.

4.2 Maintenance Procedures:

- a. General: No regular maintenance procedure is followed at this dam. Some work is done intermittently as the need arises. Grass is growing on both upstream and downstream surfaces and is not mowed on a regular basis. There are saplings growing on the upstream side.
 - b. Operating Facilities: The operating facilities are maintained as the need arises. There is no trash rack at the low level outlet structure to prevent floating debris from falling in. The high level outlet valves are operated regularly in the process of filling the water tanktrucks.
- 4.3 Evaluation: Maintenance procedures followed for the spillway, spillway approach and discharge channel, emergency spillway, upstream slope, and downstream slope of the dam are in need of improvement. A formal program of operation and maintenance procedures should be implemented including documentation to provide complete records for future reference. Also, a downstream warning system should be developed and implemented within the time frame indicated in Section 7.

SECTION 5

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General: Halchek Pond Dam is an earth embankment dam, approximately 760 feet long, 18 feet wide at the crest, and an average of 25 feet high. The highest point is at the discharge point of the outlet conduit, where the dam reaches a height of 26.5 feet. The primary spillway, which is constructed of reinforced concrete, is 20.4 feet wide and its crest is 6.4 feet below the top of the dam. This spillway is located near the left abutment of the dam. At the present time, there are two flashboards in place on the spillway, effectively raising the water level in the pond by 2 feet. Normal water level elevation is, however, maintained at the spillway crest level. At the right abutment of the dam is the emergency spillway, constructed of loose earth fill, approximately 30 feet wide at its base, and 4.1 feet below the top of the dam. For purposes of hydraulic calculation, both spillways were considered as broad crested weirs. A 2 foot square concrete box culvert passes beneath the center of the dam and is controlled by an inlet structure at the upstream side of the dam which acts as an overflow spillway when the water level is 2.9 feet above the primary spillway crest.

The downstream channel of Keene Brook is not well defined because of the wetland areas adjacent to the stream just below the dam. The channel could be considered in generally poor condition with banks overgrown with trees and brush.

The watershed encompasses an area of 1.55 square miles, basically wooded and with limited development. The greatest concentration of homes may be found along Village Hill Road, which forms the westerly boundary of the watershed area.

At spillway elevation, Halchek Pond has a storage capacity of 81 acre feet, which increases to 154 acre feet at the top of the dam.

The test flood for this site is half the Probable Maximum Flood ($\frac{1}{2}$ PMF), which produces an inflow of 1,650 cfs into Halchek Pond. The corresponding outflow through the dam is 1,620 cfs. Since the capacity of the primary spillway and emergency spillway is 1,840 cfs at the top of the dam, this represents approximately 112% of the test flood outflow. This means the dam will not be overtopped during

the occurrence of the test flood and that the test flood level will be approximately 0.5 feet below the level of the top of the dam.

- 5.2 Design Data: Limited design data was obtained from State files. There was no confirmation, however, that these designs were followed during the construction of the dam. After speaking with the owner at the site during the course of the inspection, it was found that many changes were made from the original plans. No record of these changes had been kept, so that the hydraulic and hydrologic data contained herein was determined at the time of the inspection.
- 5.3 Experience Data: No records on past experience were found to be available for this site. The owner indicated, however, that from his visual recollection the highest level attained was 3 feet above the spillway crest with two feet of flashboards in place (thus, 1 foot above the flashboards).
- 5.4 Test Flood Analysis: Based on the "Recommended Guidelines for Safety Inspection of Dams", the dam is classified as SMALL in size with a SIGNIFICANT hazard potential. The test flood for these conditions ranges from the 100-year frequency flood to half the Probable Maximum Flood (100-year to $\frac{1}{2}$ PMF). Because of the potential downstream damage and loss of life involved with failure, the $\frac{1}{2}$ PMF was chosen as the test flood for this dam.

Using the HEC-1 Flood Hydrograph Computer program developed by the Army Corps of Engineers for dam safety investigations, the inflow and outflow for the test flood were found to be 1,650 cfs (1,060 CSM) and 1,620 cfs, respectively, at the dam site. The dam's outflow capacity of 1,840 cfs at the top of the dam represents approximately 112% of the test flood outflow (not including flow through the low level outlet). Thus, no overtopping of the dam would occur and 0.5 feet would remain between the test flood level and the top of the dam.

Since normal pool level is maintained at the spillway crest elevation, calculations for the test flood were based on the assumption that no flashboards would be in place. As noted in Section 7 of this report, a recommendation will be made that the existing flashboards be removed to provide sufficient capacity to pass the storm flow. At present, if flashboards are maintained 2 feet above the spillway crest level, the dam will not pass the test flood flows. Should the owner wish to maintain a

higher water level with flashboards in place, a full study of the dam's capacity should be made by a qualified registered engineer.

Although some storage is available in wetland areas throughout the basin, it was not considered significant in the event of the ½ PMF and, therefore, not included in the development of the inflow hydrograph to Halchek Pond.

- 5.5 Dam Failure Analysis: A dam failure analysis was performed using the "Rule of Thumb" method for estimating downstream dam failure hydrographs, as developed by the Corps of Engineers. Failure was assumed to occur when the water level in the pond was at the level of the top of the dam. The discharge of the spillways and the low level outlet just prior to the dam's failure would be 1,840 cfs, producing a depth of flow of approximately 7 feet in the stream channel at a point 1,650 feet downstream of the dam (where the home which could receive possible damage is located). The calculated discharge for dam failure is 49,550 cfs and will produce a depth of flow of 13 feet at the same downstream point near Kucko Road. This means an increase in water depth at the time of failure of 6 feet. Prior to the dam failure there would be no flooding at the house near Kucko Road, while post-failure flood depths would be at least 2 feet above the sill elevation of the house. The failure analysis covered a distance of 8,650 feet downstream, as shown by the calculations in Appendix D. The depth of flow at that point (near the intersection of Route 32) was calculated to be 13 feet. This would overtop Route 32 by about one foot.

A breach of the dam could damage one home (located 1,650 feet downstream at Kucko Road), a state road, two local roads, and potentially cause the loss of a few lives. Therefore, the dam has been classified as having a SIGNIFICANT hazard potential.

SECTION 6

EVALUATION OF STRUCTURAL STABILITY

- 6.1 Visual Observations: No evidence of structural instability was observed during the visual inspection. The extensive seepage, however, could represent a potential threat to the stability of the dam.
- 6.2 Design and Construction Data: There is no design and construction data available to permit a formal evaluation of the stability of the dam. In particular, there is no information on the type of foundation soils that would allow any evaluation of the possible effect of the extensive seepage observed at the toe of the dam. Also, there is no information concerning zoning materials, if any, in the earth dam.
- 6.3 Post Construction Changes: The elevation of the reservoir has been raised approximately 2 feet with the installation of wooden flashboards at the principal spillway; also, uncompacted fill was deposited at the emergency spillway. These changes were made after the dam was inspected by the State of Connecticut.
- 6.4 Seismic Stability: The dam is located within Seismic Zone 1 and, in accordance with the Phase I Inspection Guidelines, does not warrant seismic stability analysis.

SECTION 7

ASSESSMENT, RECOMMENDATIONS, REMEDIAL MEASURES

7.1 Dam Assessment:

- a. Condition: The dam is judged to be in fair condition on the basis of the visual inspection. The future integrity of the dam could be affected by the following:
 - 1. The extensive seepage observed downstream of the dam could represent a threat of piping under unfavorable foundation soil conditions, i.e., if the foundation soils consist of silts or other soils susceptible to piping.
 - 2. The emergency spillway channel may direct flow against the downstream toe of the dam, which could result in erosion of the dam.
 - 3. The growth of small trees on the upstream slope, if unchecked, could cause increased seepage in the future along decaying roots.
 - 4. The continued use of flashboards at the primary spillway, which should be discontinued because the dam is not capable of passing the test flood flows with the boards in place.
 - 5. The emergency spillway construction should be reviewed since the present raised emergency spillway is constructed of loose materials and is saturated.
- b. Adequacy of Information: The lack of in-depth engineering data did not allow for a definitive review. The adequacy of this dam could not be assessed from a review of design and construction data, particularly since the construction did not follow procedures outlined in the design.
- c. Urgency: The recommendations and remedial measures described below should be implemented by the owner within one year after receipt of the Phase I inspection report.

7.2 Recommendations: It is recommended that the Owner employ a qualified registered engineer to perform the following:

- a. The significance of the seepage observed should be evaluated, and if needed, a foundation drainage system should be constructed. A method and schedule to monitor seepage should be developed.
- b. Assess the need for reconstructing or improving the emergency spillway and providing cover for the discharge channel.
- c. Evaluate the condition of the spillway surfaces and their structural conditions.
- d. Remove the existing flashboards from the primary spillway. If the Owner wishes to maintain a higher water level, a full hydrologic and hydraulic study with recommended improvements should be made by an engineer.

7.3 Remedial Measures:

- a. A formal monitoring program should be established to observe seepage areas every two months for indications of concentrated flow or soil transport.
- b. Trees and brush on both the upstream and downstream slope of the dam should be removed. This should include a 20 foot area from the downstream toe. Excavations must then be backfilled with suitable material. Grass should be planted in disturbed areas to protect the embankment from erosion.
- c. Emergency procedures consisting of an operations plan and warning system for downstream residences should be developed and implemented.
- d. Conduct a technical inspection of this facility on an annual basis.
- e. Construct a permanent walkway from the dam to the intake structure of the low level outlet.
- f. Remove the flashboards from the primary spillway until improvements for the emergency spillway and its channel have been assessed, until the engineer performs a hydrologic and hydraulic investigation of the site if the water level is to be raised to flashback height, and until the seepage at the toe of the dam has been investigated and corrected.

- g. Install a trash rack over the drop inlet to the low level outlet to prevent debris from falling into the structure.
 - h. Provide a stabilizing grass cover along the crest of the dam to prevent erosion. Provide topsoil as required to ensure that grass will grow in all areas presently exposed along the top of the dam.
- 7.4 Alternatives: There are no practical alternatives to the above listed recommendations.

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT HALCHEK POND DAM

DATE December 11, 1980

TIME 3:00 p.m.

WEATHER Clear, 25°

W.S. ELEV. _____ U.S. _____ DN.S. _____

PARTY:

- | | |
|-----------------------------------|---------------------------------|
| 1. <u>John Lenard, L.D.E.I.</u> | 6. <u>Charles Fitts, G.E.I.</u> |
| 2. <u>Kent Healy, L.D.E.I.</u> | 7. _____ |
| 3. <u>Karl Acimovic, L.D.E.I.</u> | 8. _____ |
| 4. <u>Eric Ohlund, L.D.E.I.</u> | 9. _____ |
| 5. <u>Gonzalo Castro, G.E.I.</u> | 10. _____ |

PROJECT FEATURE	INSPECTED BY	REMARKS
1. <u>Structural</u>	<u>John Lenard</u>	
2. <u>Hydraulics</u>	<u>Karl Acimovic</u>	
3. <u>Geotechnical</u>	<u>Gonzalo Castro</u>	
4. <u>Geotechnical</u>	<u>Kent Healy</u>	
5. <u>Geotechnical</u>	<u>Charles Fitts</u>	
6. <u>Survey</u>	<u>Eric Ohlund</u>	
7. _____		
8. _____		
9. _____		
10. _____		

PERIODIC INSPECTION CHECKLIST

PROJECT HALCHEK POND DAMDATE December 11, 1980

PROJECT FEATURE _____

NAME _____

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITION
<u>DAM EMBANKMENT</u>	
Crest Elevation	
Current Pool Elevation	2 feet above primary spillway crest
Maximum Impoundment to Date	3 feet+ above spillway crest
Surface Cracks	None observed
Pavement Condition	Not applicable
Movement or Settlement of Crest	Too irregular to judge
Lateral Movement	Not applicable
Vertical Alignment	Not applicable
Horizontal Alignment	Not applicable
Condition at Abutment and at Concrete Structures	Good
Indications of Movement of Structural Items on Slopes	None observed
Trespassing on Slopes	None. Beach area at left end.
Sloughing or Erosion of Slopes or Abutments	None observed
Rock Slope Protection - Riprap Failures	Riprap in good condition. No riprap at beach area.
Unusual Movement or Cracking at or Near Toe	None observed
Unusual Embankment or Downstream Seepage	Extensive seepage at toe and downstream of toe. Area of ponding left of low level outlet.
Piping or Boils	None observed
Foundation Drainage Features	None
Toe Drains	None
Instrumentation System	None
Vegetation	Small trees on upstream slope, grass-covered downstream slope.

PERIODIC INSPECTION CHECKLIST

PROJECT HALCHEK POND DAMDATE December 11, 1980

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
<u>DIKE EMBANKMENT</u> Crest Elevation Current Pool Elevation Maximum Impoundment to Date Surface Cracks Pavement Condition Movement or Settlement of Crest Lateral Movement Vertical Alignment Horizontal Alignment Condition at Abutment and at Concrete Structures Indications of Movement of Structural Items on Slopes Trespassing on Slopes Sloughing or Erosion of Slopes or Abutments Rock Slope Protection - Riprap Failures Unusual Movement or Cracking at or Near Toes Unusual Embankment or Downstream Seepage Piping or Boils Foundation Drainage Features Toe Drains Instrumentation System Vegetation	<i>Not applicable</i>

PERIODIC INSPECTION CHECKLIST

PROJECT HALCHEK POND DAM DATE December 11, 1980

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION	
	LOW LEVEL	HIGH LEVEL
<u>OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE</u>		
a. Approach Channel		
Slope Conditions	<i>Not applicable</i>	<i>Not applicable</i>
Bottom Conditions		
Rock Slides or Falls		
Log Boom		
Debris		
Condition of Concrete Lining		
Drains or Weep Holes		
b. Intake Structure		
Condition of Concrete	<i>Good, some efflorescence, seepage along joints of forms. Holes for maintenance of low flow.</i>	<i>Not observable, under water. Two valves, one upstream and one downstream of crest. ~2½"-diameter riser pipe.</i>
Stop Logs and Slots		
Other	<i>Top of outlet structure is below crest of dam and would act as a drop inlet spillway. Presently ~1' freeboard. No grate.</i>	

PERIODIC INSPECTION CHECKLIST

PROJECT HALCHEK POND DAMDATE December 11, 1980

PROJECT FEATURE _____

NAME _____

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - CONTROL TOWER</u>	<i>Not applicable.</i>
a. Concrete and Structural	
General Condition	
Condition of Joints	
Spalling	
Visible Reinforcing	
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	
Joint Alignment	
Unusual Seepage or Leaks in Gate Chamber	
Cracks	
Rusting or Corrosion of Steel	
b. Mechanical and Electrical	
Air Vents	
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System	

PERIODIC INSPECTION CHECKLIST

PROJECT HALCHEK POND DAMDATE December 11, 1980

PROJECT FEATURE _____

NAME _____

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITION	
	LOW LEVEL	HIGH LEVEL
<u>OUTLET WORKS - TRANSITION AND CONDUIT</u>		
General Condition of Concrete	Good at downstream end.	6" steel pipe on concrete block. Good condition.
Rust or Staining on Concrete	None	
Spalling	None	
Erosion or Cavitation	None	
Cracking	None	
Alignment of Monoliths	Not applicable	
Alianment of Joints	Not applicable	
Numbering of Monoliths	Not applicable	

PERIODIC INSPECTION CHECKLIST

PROJECT HALCHEK POND DAM DATE December 11, 1980
 PROJECT FEATURE _____ NAME _____
 DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION	
	LOW LEVEL	HIGH LEVEL
<u>OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL</u>		
General Condition of Concrete	<i>Not applicable</i>	<i>Not applicable</i>
Rust or Staining		
Spalling		
Erosion or Cavitation		
Visible Reinforcing		
Any Seepage or Efflorescence		
Condition at Joints		
Drain holes		
Channel	<i>Discharges into flat, swampy area</i>	<i>No channel</i>
Loose Rock or Trees Overhanging Channel		
Condition of Discharge Channel	<i>Natural streambed</i>	

PERIODIC INSPECTION CHECKLIST

PROJECT HALCHEK POND DAM DATE December 11, 1980

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION	
	PRINCIPAL	EMERGENCY
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS		
a. Approach Channel	<i>Not applicable</i>	<i>Not applicable</i>
General Condition		
Loose Rock Overhanging Channel		
Trees Overhanging Channel		
Floor of Approach Channel		
b. Weir and Training Walls	<i>Concrete training walls.</i>	<i>Open cut channel at right abutment.</i>
General Condition of Concrete	<i>Good</i>	<i>Temporary ~1½' dike across upstream end of emergency spillway.</i>
Rust or Staining	<i>None</i>	
Spalling	<i>None</i>	
Any Visible Reinforcing	<i>None</i>	
Any Seepage or Efflorescence	<i>None</i>	
Drain Holes	<i>None</i>	
c. Discharge Channel		<i>Ill-defined channel downstream of abutments, could bring flow along toe of dam.</i>
General Condition	<i>Good</i>	
Loose Rock Overhanging Channel	<i>None</i>	
Trees Overhanging Channel	<i>Some</i>	
Floor of Channel	<i>Cobbles, gravel, boulders</i>	
Other Obstructions	<i>None</i>	
Other Comments		<i>Channel cut into natural soil. Erosion has exposed boulders in till.</i>

PERIODIC INSPECTION CHECKLIST

PROJECT HALCHEK POND DAM DATE December 11, 1980

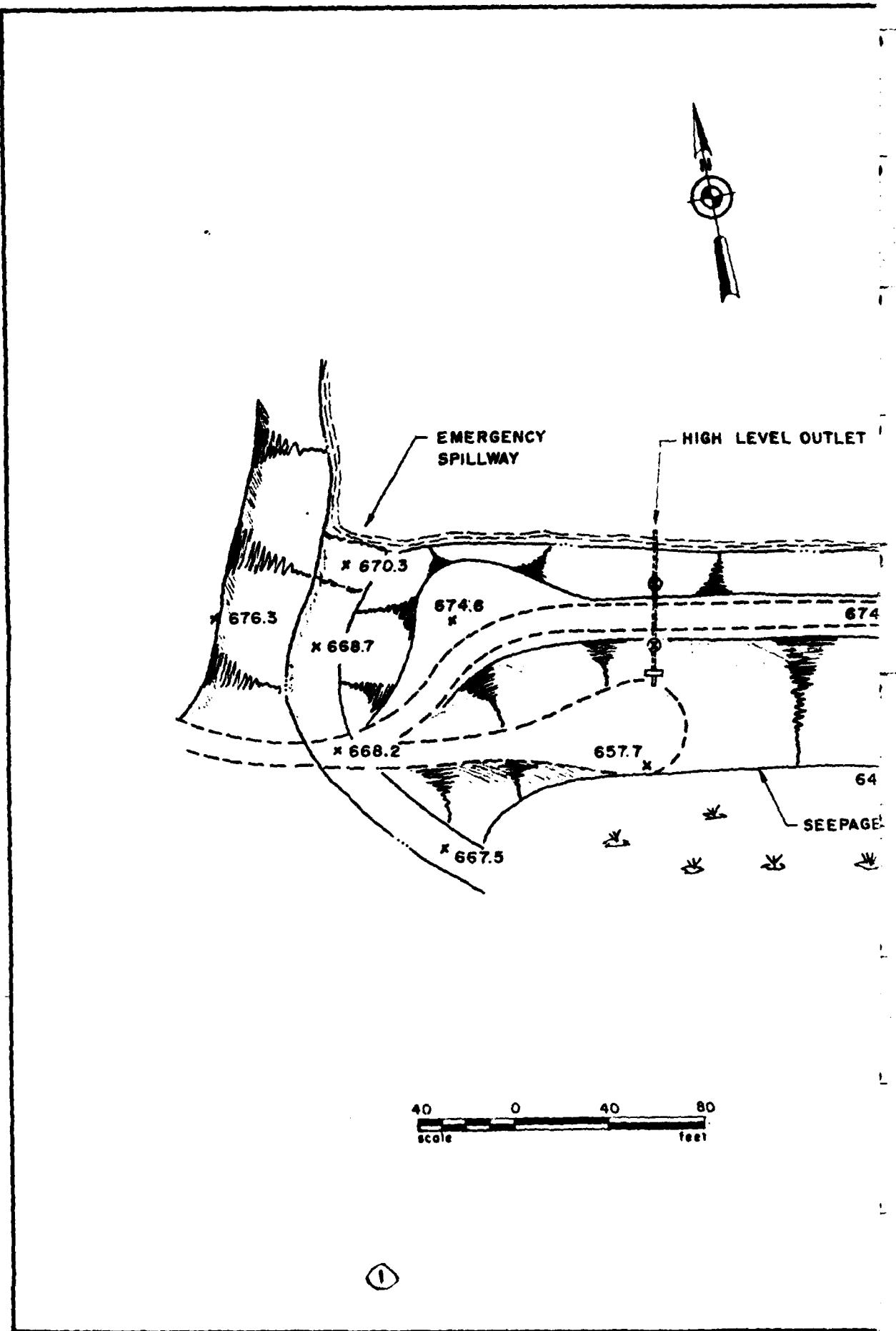
PROJECT FEATURE _____ NAME _____

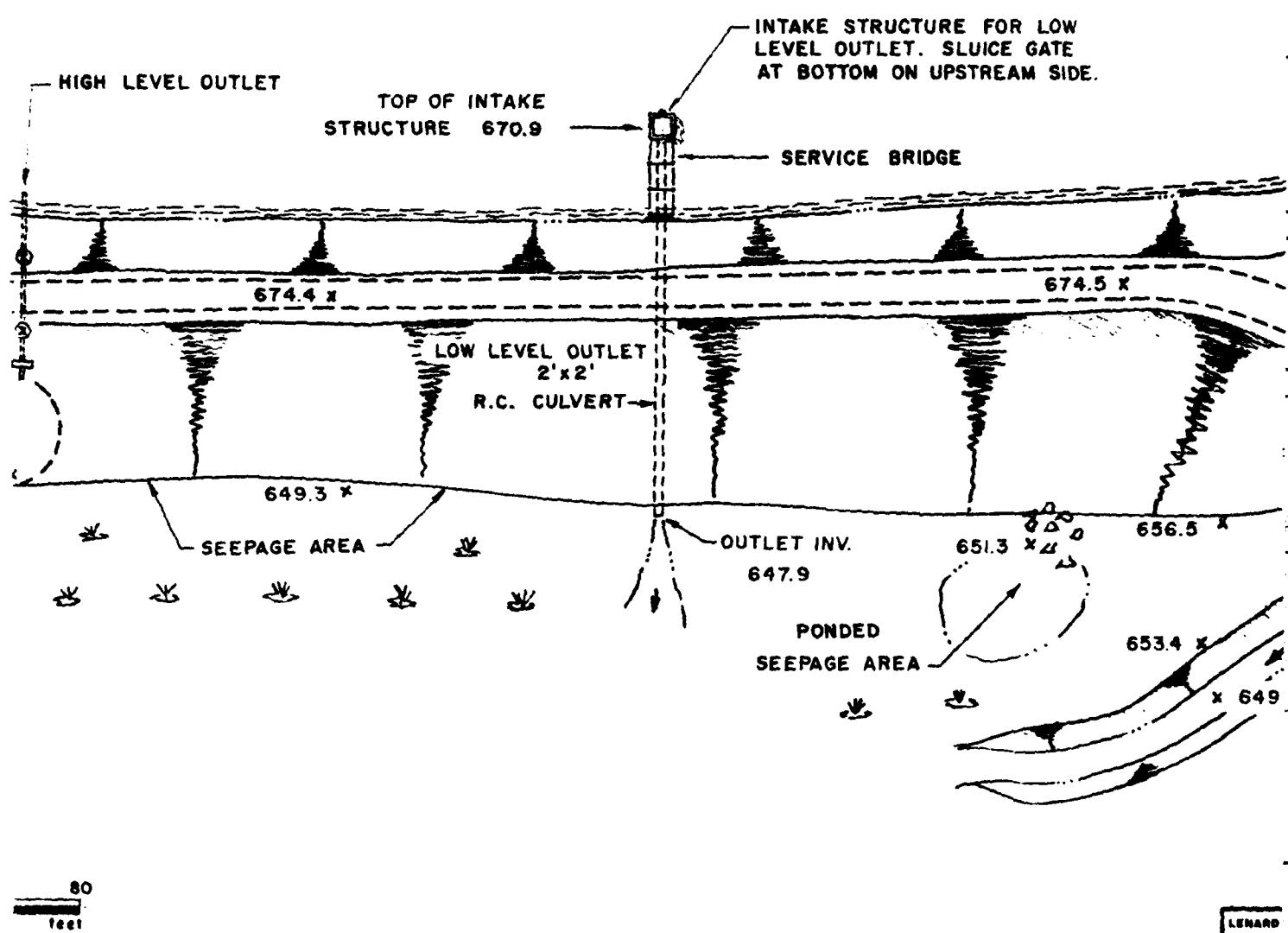
DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SERVICE BRIDGE</u>	<i>Steel structure in good condition, only planks loose.</i>
a. Super Structure Bearings Anchor Bolts Bridge Seat Longitudinal Members Underside of Deck Secondary Bracing Deck Drainage System Railings Expansion Joints Paint b. Abutment & Piers General Condition of Concrete Alignment of Abutment Approach to Bridge Condition of Seat & Backwall	

APPENDIX B

ENGINEERING DATA

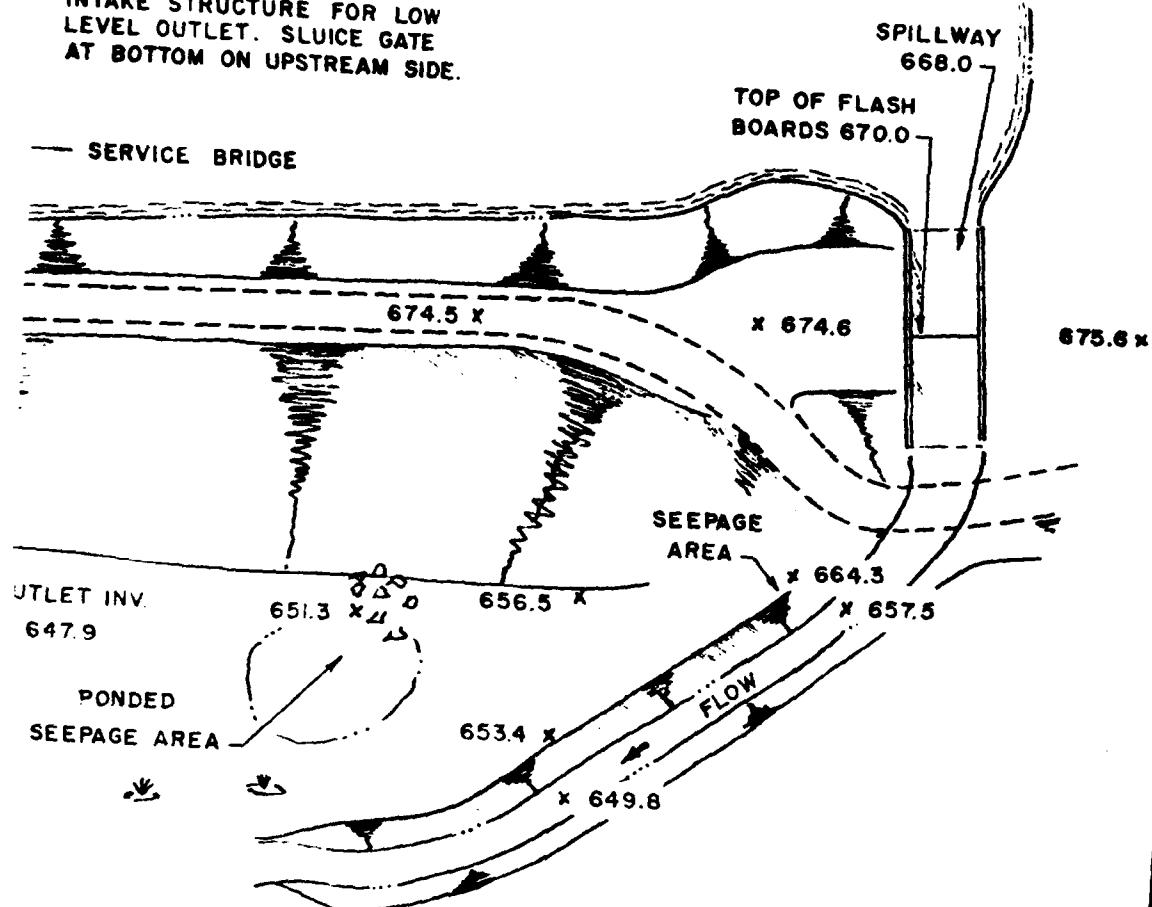




(2)

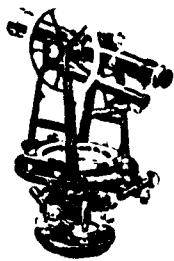
- INTAKE STRUCTURE FOR LOW LEVEL OUTLET. SLUICE GATE AT BOTTOM ON UPSTREAM SIDE.

- SERVICE BRIDGE



(3)

LENARD DILAJ ENGINEERING, INC. STOKE, CONNECTICUT ENGINEERS	US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS				
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS					
SITE PLAN					
HALCHEK POND DAM					
WILLINGTON, CT					
DESIGNED BY	CHECKED BY	APPROVED BY	SCALE	DATE	SPOT
KA					



Stanley L. Allen
Peekham Lane
Danielson, Connecticut

July 30, 1955

Mr. Joseph Halcheck
Village Hill Road
Stafford Springs, Conn.

Dear Mr. Halcheck:

I am forwarding to you under separate cover three (3) sets of plans for your dam. Also enclosed herewith are three (3) sets of specifications of this project.

One set of both plans and specification should be filed with you application for the construction of this dam. This application must be made to the State Board for the Supervision of Dams, Dikes, Reservoirs and other Similiar Structures, the address is Room 317, State Office Building, Hartford, Conn.

I would suggest that you take a trip into Hartford and make application and leave the plans and find what will be required. I rather imagine the member who will be assigned to this work will be John J. Mozzochi of Glastonbury.

If they require any changes I will be glad to make these for you.

Very truly yours,

Stanley L. Allen
Stanley L. Allen

MR. WISE -

MR. HALCHECK LEFT THESE PLANS & SPECS AT MY OFFICE.
STAFFORD SPRINGS IS NOT IN MY DISTRICT, SO I AM
FORWARDING THEM TO YOU.

8 5/55

John

SIMPLY WRITTEN COMM. CO. LTD.

B-2

STATE OF CONNECTICUT



STATE BOARD OF SUPERVISION OF DAMS

ROOM 317, STATE OFFICE BUILDING, HARTFORD

Created by Chapter 290 of the Public Acts of 1939 to supervise dams, dikes, reservoirs and other similar structures. All such structures, with their appurtenances, without exception and without further definition or enumeration herein, which, by breaking away or otherwise, might endanger life or property, shall be subject to the jurisdiction conferred by this act.

PLEASE REPLY TO

August 23, 1955

Mr. Henry W. Buck
650 Main Street
Hartford, Connecticut

Re: Mr. Joseph Halcheck,
Stafford Springs

Dear Mr. Buck:

As you can see these plans were left in Mr. Mozzochi's office and as they are not in his district they are being forwarded to you as Stafford Springs is in your territory. I feel that the engineer, Mr. Stanley L. Allen, has done all the work possible and is now asking for your decision, so I am sending you the complete file.

If you feel there is anything I can do further, please telephone.

Sincerely yours,

E. A. Dell

E. A. Dell
Sanitary Inspector

BAD/p

Enclosure

AUG 24 1955 W.B.

B-3

M.

650 MAIN STREET
HARTFORD 3, CONNECTICUT

A-153-68

NOVEMBER 9, 1955

MR. JOSEPH HALCHECK
VILLAGE HILL ROAD
STAFFORD SPRINGS, CONNECTICUT

DEAR MR. HALCHECK:

I ENCLOSE HEREWITH CONSTRUCTION PERMIT No. 5-57
COVERING YOUR PROPOSED DAM ON KEENE BROOK IN THE TOWN OF
ELLINGTON.

WILLINGTON? WOULD YOU ASK MR. ALLEN TO FURNISH US WITH TWO ADDITIONAL SETS OF PLANS FOR THIS CONSTRUCTION. ONE OF THESE SETS WILL BE APPROVED AND RETURNED TO YOU AND THE OTHER IS FOR THE FILES IN THE STATE OFFICE BUILDING.

AS I EXPLAINED TO MR. ALLEN, I SHALL WISH TO INSPECT THE CONSTRUCTION WHEN THE FOUNDATION IS OPEN READY TO PLACE THE BEGINNING OF THE CORE MATERIAL, AGAIN AS THE FILL AND SPILLWAY NEAR COMPLETION, AND FINALLY WHEN THE ENTIRE CONSTRUCTION IS COMPLETED AT WHICH TIME A CERTIFICATE OF APPROVAL WILL BE ISSUED IF EVERYTHING IS FOUND IN SATISFACTORY CONDITION. I WOULD APPRECIATE IT IF YOU WOULD ADVISE ME WHEN THE CONSTRUCTION APPROACHES THESE STAGES SO THAT I MAY ARRANGE MY INSPECTION TRIPS.

SINCERELY YOURS,

STATE WATER RESOURCE STATE BOARD OF SUPERVISION OF DAMS
COMMISSION
RECEIVED


HENRY WOLCOTT BUCK

ENCL: JUN 10 1971

ANSWERED _____

REFERRED _____

FILED _____

B-4

Mr. ALLEN

650 MAIN STREET
HARTFORD 3, CONNECTICUT

NOVEMBER 21, 1955

A-153-68

MR. JOSEPH HALCHEK
VILLAGE HILL ROAD
STAFFORD SPRINGS, CONNECTICUT

DEAR MR. HALCHEK:

I HAVE RECEIVED FROM MR. ALLEN THE ADDITIONAL COPIES OF THE PLANS FOR YOUR PROPOSED DAM AND AM RETURNING ONE SET HEREWITH MARKED "APPROVED."

SINCERELY YOURS,

STATE BOARD OF SUPERVISION OF DAMS


HENRY WOLCOTT BUCK

ENCL:

B-5

JUN 10 1956

JOSEPH HALCHECK
STAFFORD DYK.

SITE 1 H.W.B.

JUN 22 '56 H.W.B.

Reviewed design - see note attached to application
inspected site & photograph. Could have driven in.
Site cleared and marked already to start down.

Called Allen - No answer.

Called Allen - Gave him all requirements. He will revise plans
and send them thru & I will issue permit. Told him stages at
which I would want to inspect.

6/21/56

M.R. HALCHECK CALLED. HE IS ALL CLEARED UP AND ARRANGED
A DATE FOR AN INSPECTION. DISCUSSED WITH HIM IN DETAIL THE
CLEANING UP OF LAST WINTER'S DEBRIS THAT WILL BE REQUIRED.
HE WILL BLADE OFF THE ENTIRE FOUNDATION AND HAVE IT READY
FOR INSPECTION. ALSO WILL CLEAR OFF SEVERAL BORROW BANKS
SO THAT WE CAN DECIDE WHICH TYPE OF MATERIAL IS BEST TO USE
FOR THE CORE WHEN I VISIT NEXT THURSDAY. JUN 25 '56 H.W.B.

6/23/56

JOB INSPECTION. WENT OVER THE WORK IN DETAIL WITH
MR. HALCHECK. SELECTED A SPOIL PIT WHERE HE HAS A GOOD GRAY
CLAY WHICH HE WILL USE FOR THE CORE. HE PLANS TO MAKE THE
CORE APPROXIMATELY 26 FEET WIDE INSTEAD OF ~~24~~ FEET CALLED
FOR IN THE PLANS AS THIS WILL LET HIM USE EQUIPMENT WHICH HE
HAS AVAILABLE. SAID THIS WOULD BE ENTIRELY SATISFACTORY.
HE WILL REMOVE THE STUMPS AND OTHER VEGETABLE MATTER FROM THE
DOWNSTREAM WASTE PILE BEFORE INCORPORATING IT INTO THE DAM.
HE WILL SEGREGATE THE LARGER STONES FROM HIS GRAVEL BANKS AND
USE THEM FOR PAVING THE EMERGENCY SPILLWAY. APPROVED THE
GRAVEL BANKS HE HAS FOUND ~~at~~ AT EITHER END OF THE DYKE FOR
USE AS GENERAL FILL AND THE USE OF REINFORCED CONCRETE PIPE
DRAW TUBE. HE EXPECTS TO WORK ALL SUMMER AND
HAVE THE JOB FINISHED THIS FALL. JUN 27 '56 H.W.B.

June 22, 1971

Mr. Joseph Halchek
188 Village Hill Road
Stafford Springs, Conn.

Re: Joseph Halchek Dam
Willington

Dear Mr. Halchek:

On June 3, 1971, Mr. Charles Pelletier, Division Engineer, inspected the site of your earth dam now under construction on Keene Brook and for which Preliminary Permit 5-51 was issued to you on November 9, 1955.

We requested your engineer, Mr. Stanley L. Allen, to send us copies of the plans for our review and the issuance of a new Construction Permit, since the original one has expired.

Our only comment is that in the section through the abutment there is a discrepancy between the elevations shown as 96 and 98 and the six foot dimension indicated between them. Also it appears that the abutment on the east end of the spillway may be subject to wash out around the end of it during high water. It may be desireable to extend the height of this abutment to elevation 103.

When your engineer has resolved these questions and/or submitted revised plans we will again review the plans and recommend that a Construction Permit be issued at that time if we feel that the design calls for a safe structure.

Very truly yours,

William H. O'Brien, III
Civil Engineer

WHO:ljk

cc: Stanley Allen

B-7

Water Resources

October 26, 1971

Mr. Joseph Halchek
188 Village Hill Road
Stafford Springs, Conn.

Re: Joseph Halchek Dam
Willington

Dear Mr. Halchek:

We have checked your plan dated Revised October, 1955 and Revised August, 1971, in greater detail especially in regard to the spillway capacity and we feel that 400 C.F.S. based on 1938 data does not provide a sufficient factor of safety against overtopping.

We therefore request that a spillway with a capacity of at least 600 C.F.S. with 1.5 feet of freeboard be provided. It is our understanding that there is a low section along the perimeter of the pond which may be used as an emergency spillway. It may be desirable, if it is practical, to construct such an emergency spillway to provide even greater insurance against overtopping. If such is to be constructed, it should be indicated on the plans.

When we have received revised plans we will again review this application.

Very truly yours,

William H. O'Brien, III
Civil Engineer

WHO:ljjg

cc: Mr. Stanley Allen
Dan W. Lufkin, Commissioner
Dept. of Environmental Protection

B-8

March 17, 1972

Mr. Stanley Allen
1 Sunset Drive
Danielson, Connecticut

Subject: Joseph Halchek Dam
Willington

Dear Mr. Allen:

We have reviewed the plans dated Revised October 1955, Revised August 1971, and Revised January 1972. We feel that these plans are acceptable from a safety standpoint, and will recommend to the Commissioner that a Construction Permit be issued.

Before we can forward the forms to the Commissioner for his approval, we will require your seal and signature on the plans, returned herein. When we receive your reply, we will process the Construction Permit.

We feel that you should be involved in supervising the construction of this dam. What supervision have you exercised to date, and what are your future intentions?

Very truly yours,

William H. O'Brien III
Civil Engineer

WIO:d

enclosures

April 17, 1972

Mr. Joseph Halchek
188 Village Hill Road
Stafford Springs, Conn.

Re: Joseph Halchek Dam
Willington

Dear Mr. Halchek:

The undersigned inspected the site on March 20, 1972, and we would make the following observations:

1. There were many large stones (two feet in diameter and larger) in evidence in both the core and embankment material. It is our understanding that you have been using some sort of a front end fork loader with 4" spacing between the tines to remove stones after the fill has been dumped and prior to compaction. You should continue this practice to insure that no stones with greater than a 4" diameter are within the embankment.
2. The center core of the embankment for most of the length of the dam had been placed to a higher elevation than the fill on each side. Some of this core material had washed down onto the coarser material on either side of the core. This thin layer of material should be removed before placing additional fill.
3. The entrance to the outlet structure was partially blocked with lumber from construction and debris, and there was evidence that the water had risen previously to within 5 feet of the top of the concrete overflow structure. This opening and the area around it should immediately be cleared of all debris to allow free passage of run-off, and should be checked and kept clear especially during rainstorms.

We have received an unsigned letter dated April 8, 1972, from your engineer, Mr. Stanley Allen, stating that he had made several inspections of the dam as it was being constructed, and would be

Mr. Joseph Halchek
April 17, 1972
Page Two

glad to exercise further supervision if he is so authorized by you. We feel that such supervision is desirable at whatever interval Mr. Allen feels is necessary. In your letter of April 10, 1972, you indicate that you have spoken to Mr. Allen and that he will be inspecting your construction to completion.

We have recommended approval on the revised plans and have sent the plans and the Construction Permit to the Commissioner's office for his action, which should be forthcoming.

Very truly yours,

William H. O'Brien
Civil Engineer

WHO/vc

cc: Stanley Allen



STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION
STATE OFFICE BUILDING HARTFORD, CONNECTICUT 06115

April 27, 1972

WATER RESOURCES

CONSTRUCTION PERMIT FOR DAM

Mr. Joseph Melchek
188 Village Hill Road
Stafford Springs, Conn.

TOWN: Willington
RIVER: Roaring Brook
TRIBUTARY: Keene Brook

Dear Mr. Melchek:

Your application for a permit to (explore) a dam on Keene Brook
(construct)

in the Town of Willington in accordance

with plans prepared by Stanley L. Allen

dated Revised Oct., 1968, Aug., 1971 and has been reviewed.

Feb., 1972 and signed April 7, 1972

The construction, in accordance with those plans, is APPROVED under the conditions which follow.

I. The Commissioner shall be notified as follows:

When construction has been completed and before water is impounded.

II. This permit with the plans and specifications must be kept at the site of the work and made available to the Commissioner at any time during the construction.

III. If any changes are contemplated or required, the Commissioner must be notified and supplementary approval obtained.

IV. If the construction authorized by this permit is not started within one year of the date of this permit and completed within two years of the date, this permit must be renewed.

V. Additional requirements -

ENR 98

Design Constants.

$Q = 200 \text{ C.F.S.}$ Design Constant
based on 1938 Hurricane Data

Drainage Area 2 square miles based
on U.S. G & G Map

$$Q = 3.2 L H^{3/2} \text{ Formula}$$
$$200/2 = 3.2 L \times 4^{3/2}$$
$$L = 16'$$

say 20' Spillway.

Emergency Spillway for Additional

$Q = 200 \text{ C.F.S.}$ Freeboard Min 1.5'

$$200 = 3.2 L \times 2^{3/2}$$

$$9.06 L = 200$$

$$L = 22'$$

Depth 2' Freeboard plus 2' water

24'

Cross slope 3/16" / ft

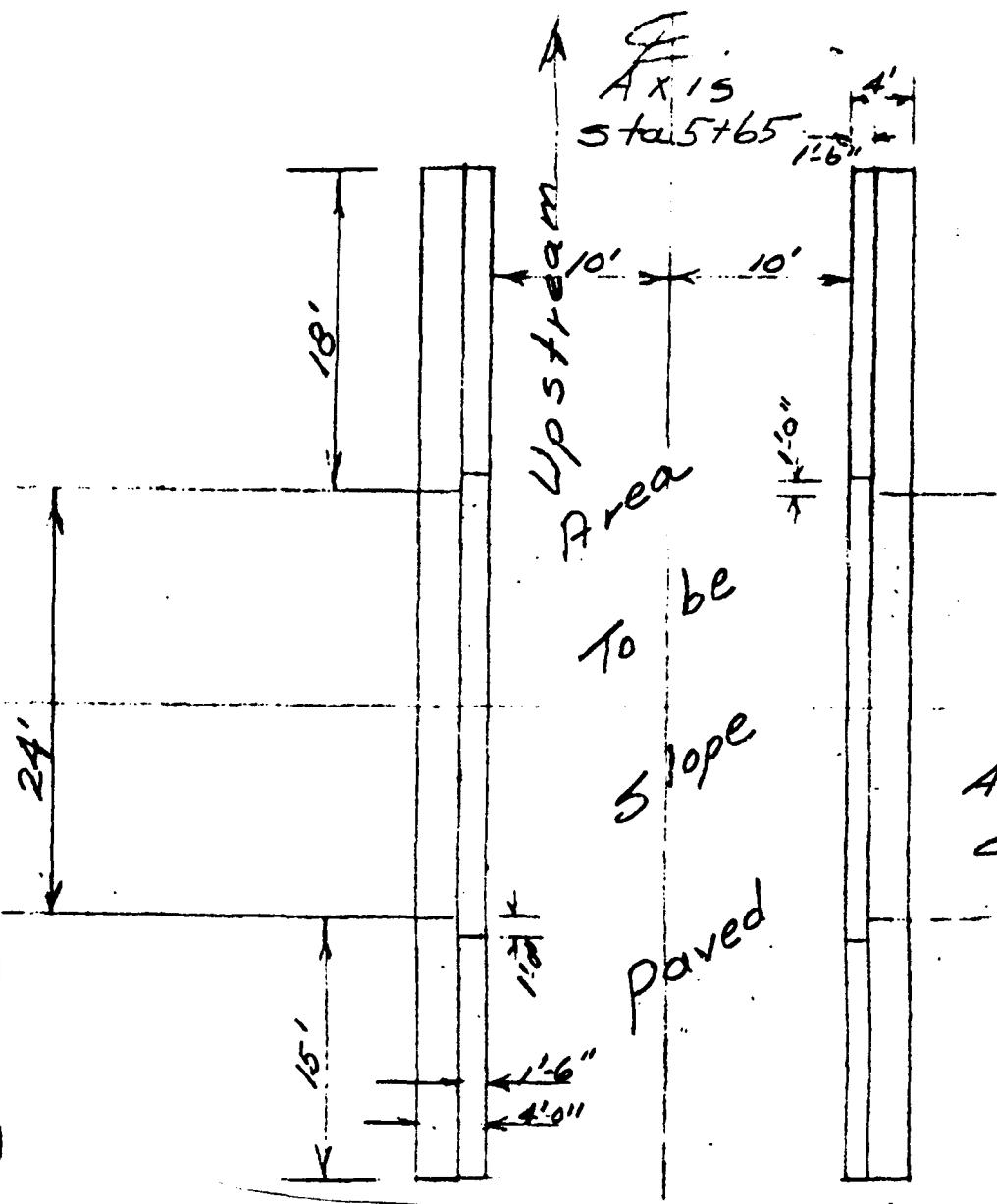
el. 100

el. 90

~~Pipe to be laid on grade and
true to line and slope~~

150'-24" pipe line

care to be carried to



Construction Plan for Spillway by Stanley Allen

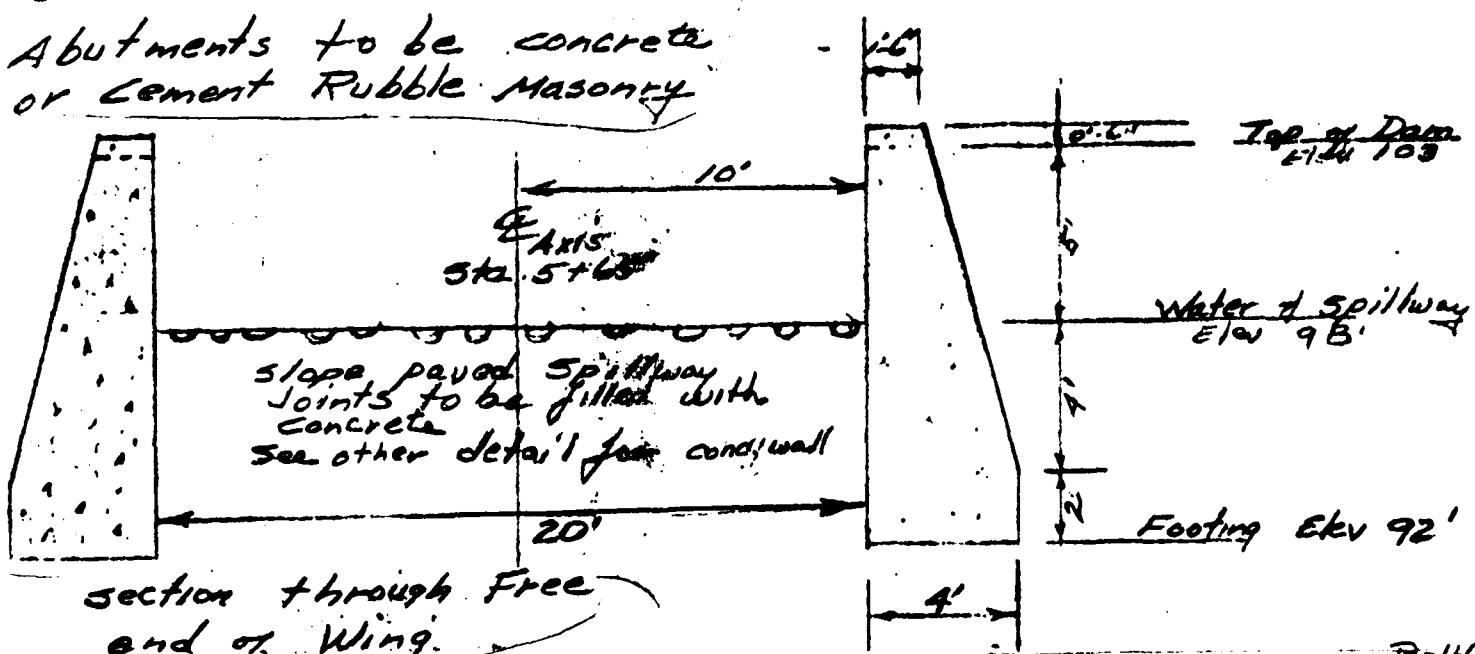
G. Dam.

Abutments Symmetrical
on all axis

Plan: 1" = 10'

Section Through Abutment

Abutments to be concrete or cement Rubble masonry



Professional Engineer Registration No. 1959

Stanley L. Allen
Danielson, Conn.

July 25, 1955

Halcheck Dam
Village Hill Road
Stafford Springs,
Connecticut

REPORT AND SPECIFICATIONS

REPORT:

OWNER: Joseph Halcheck
Village Hill Road,
Stafford Springs, Conn.

The location of this proposed Dam is on Keene Brook, in the Town of Stafford Springs, Connecticut. The specific location is East of the Village Hill Road and is approximately one (1) mile North of the Junction of Keene Brook and Roaring Brook. This location is shown on the attached U. S. Geological Map of the Stafford Springs Quadrangle.

The area to be flooded consists of lowlands and swamp.

The Datum used in the survey is on an assumed elevation, as there are no Government benchmarks in this location. This Datum is referenced to a line of levels, which the U. S. Soil Conservation have established at this Dam location.

The drainage area involved is approximately two square miles. A design constant of two hundred (200) cubic feet per second per square mile (based upon the 1938 hurricane) was used in calculating the spillway area. The freeboard height from the spillway elevation to the top of dam is four (4) feet. The required width of spillway is sixteen (16) feet. The actual designed width is twenty (20) feet.

The location of the spillway is such that it will be constructed on undisturbed ground and not on the fill area off the Dam.

The outlet ditch of the spillway will likewise be in original ground area.

The foundation material in this area is apparently a very hard firm bluish clay.

The design and specifications are in accordance with a book "Low Dams", Published by the National Resources Committee and Distributed by the U. S. Government Printing Office.

The width of twenty-four (24) feet is the personal choice of Mr. Joseph Halcheck.

SPECIFICATIONS:

CLEARING AND GRUBBING:

The ground shall be cleared of all surface soil, trees, stumps, roots, boulders and other objectionable material within the limits of the Dam area, to a sufficient depth to reach good sound material. If rock is reached, all loose pieces are to be removed and all holes and crevices are to be filled and sealed with concrete.

CORE WALL:

The trench for the core is to be carried to rock or to a stratum of Clay or other impervious material.

Material used for the clay core is to be clay, or a mixture of sand, gravel and clay, and is to be free from any stone over two (2) inches in diameter.

The clay core is to be placed in layers not over twelve (12) inches in thickness and is to be thoroughly compacted before placing the following thicknesses.

When the elevation of original ground is reached, the core wall is to be placed and compacted and then the embankment built upon both sides. The core wall at all times must be at least six (6) inches, and not more than twenty-four (24) inches, higher than the sustaining embankment.

If a suitable material, with a low co-efficient of permeability is obtainable at the site, and with the approval of the Commission, the entire cross section of the Dam may be constructed from such material. In such case, the construction of the above core will be unnecessary.

SPILLWAY:

The excavation for the abutments of the spillway are to be carried to solid foundation. Back fill to be placed in layers not over twelve (12) inches in thickness and well tamped and compacted.

Abutments are to be constructed of either concrete or cement rubble masonry.

The spillway area between the abutment is to be sloped and paved as shown in drawings and the joints filled with concrete.

PIPE:

The twenty-four (24) inch pipe is to be either reinforced concrete or asphalt-coated corrugated pipe.

If reinforced concrete pipe is to be used, it shall be laid on a firm foundation true to line and grade; the bell ends shall be upstream; and the joints so adjusted that the spigot end enters to the full depth of the socket. Joints shall be caulked or sealed with concrete.

If asphalt-coated corrugated pipe is used, this pipe shall have double-riveted longitudinal joints and close-spacing circumferential joints with water-tight collars, to provide for a low pressure pipe. This shall likewise be laid on a firm foundation, true to line and grade.

Seep rings around this pipe shall be constructed as shown. If asphalt-coated corrugated pipe is used, these seep rings shall be placed at the joints of the pipe.

GATE:

Any commercial gate will be satisfactory; the exact details for the gate will be supplied by the company or person furnishing the gate.

EMBANKMENT:

The embankment on the upstream side of the core wall is to be made of selected material free from roots and other organic material and free from stones over four (4) inches in diameter. It is to be placed in layers not over twelve (12) inches in depth and well compacted.

The embankment on the down stream side of the core wall may be made of general bank material and placed in the same manner as the upstream side. The down stream embankment is to be covered with six (6) inches of loam and seeded.

RIP RAP:

Rip rap is to be placed over the entire area of the inlet to the spillway, around the outlet of the forty-two (42) inch pipe and at the curves in the ditch of the spillway. It is also to be placed on the face of the dam between elevations 95 and 100.

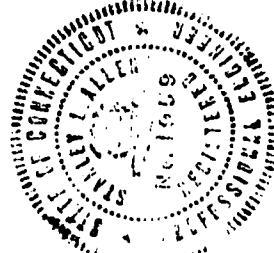
Rip rap is to be made of rock placed in line and grade having a depth in place of not less than twelve (12) inches.

The face of the dam from the bottom of the rip rap to bottom of Dam to be covered with a layer of fine gravel.

ROADWAY:

A roadway is to be constructed across the top of the Dam but it is not a part of these specifications. However, the supports for the deck must be placed on top of the abutments and center pier leaving a clear waterway the entire length and height of the spillway.

Stanley L Allen



B-17



STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

STATE OFFICE BUILDING HARTFORD, CONNECTICUT 06115



WATER AND RELATED RESOURCES

CERTIFICATE OF APPROVAL

19 December 1974

Mr. Joseph Halchek
188 Village Hill Road
Stafford Springs, CT 06076

TOWN: Willington
RIVER: Roaring Brook
TRIBUTARY: Keene Brook
CODE NO: W 10

NAME AND LOCATION OF STRUCTURE: The dam is known as the Halchek Dam located on Keene Brook east of Village Hill Road in the northwest portion of the Town of Willington.

DESCRIPTION OF STRUCTURE AND WORK PERFORMED:

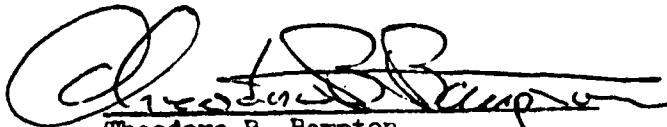
Compacted earth fill dam with concrete spillway according to plans prepared by Stanley L. Allen, P.E., dated April 7, 1972.

CONSTRUCTION PERMIT ISSUED UNDER DATE OF:

April 27, 1972

This certifies that the work and construction included in the plans submitted, for the structure described above, has been completed to the satisfaction of this department and that this structure is hereby approved in accordance with Section 25-114 of the 1971 Supplement to the General Statutes.

The owner is required by law to record this Certificate in the land records of the town or towns in which the structure is located.



Theodore B. Bampton
Deputy Commissioner
Conservation and Preservation

TBB:ljg

This paper was produced from recycled paper - both broke and roused.

D-18

APPENDIX C

PHOTOGRAPHS



Photo 1. Spillway structure from downstream, with flashboards in place



Photo 2. Upstream view of spillway discharge channel. Note boulders remaining in channel as a result of erosion.

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	HALCHEK POND DAM WILLINGTON, CONNECTICUT CT 00677 JAN. 1981 C-2
LENARD-DILAJ ENGINEERING, INC. STORRS, CONNECTICUT ENGINEER		



Photo 3. Temporary dike across emergency spillway at right abutment. Natural ground is to the right of the spillway. Dike consists of uncompacted soil.



Photo 4. Borrow area just upstream of left abutment. This material was used for upstream and downstream shelves of dam. It consists of fine gravelly sand with about 10% silt and random cobbles and boulders.

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	HALCHEK POND DAM WILLINGTON, CONNECTICUT CT 0677 JAN. 1981 C-3
LENARD-DILAJ ENGINEERING, INC. STORRS, CONNECTICUT ENGINEER		

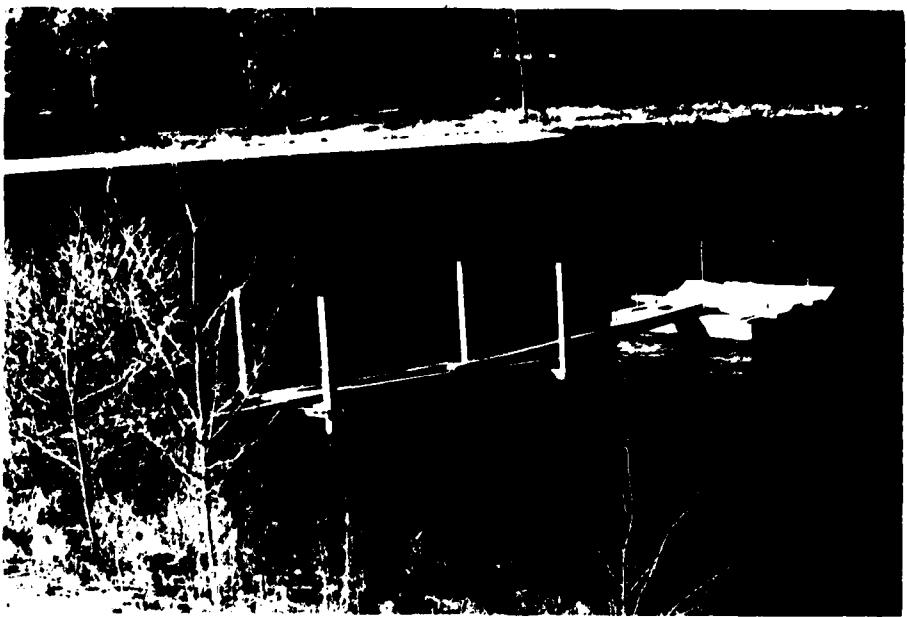


Photo 5. Intake structure and catwalk service bridge. Efflorescence and spalling along joints could be detected inside the structure. The top of the intake is 3.5 feet below the elevation of the crest.

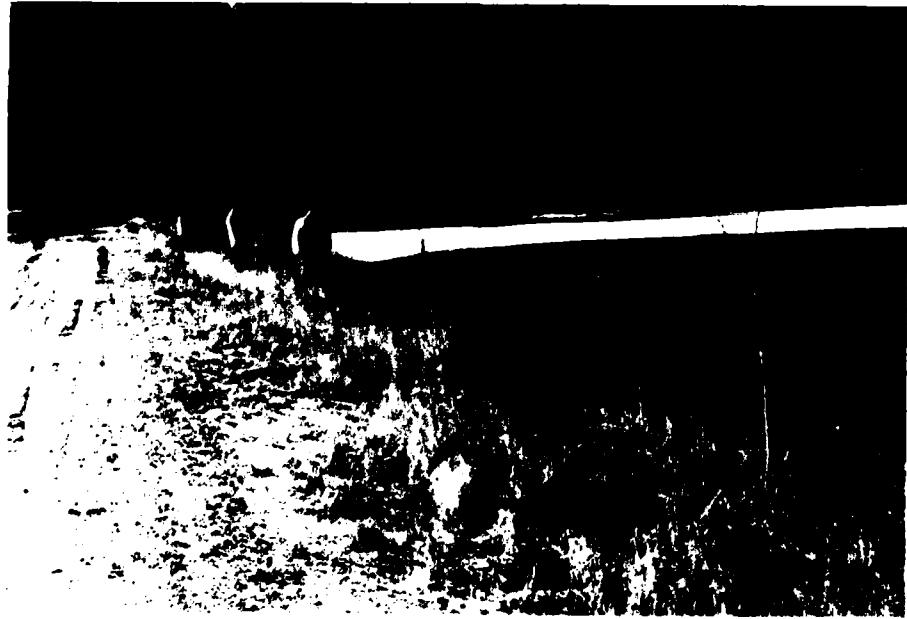


Photo 6. Upstream face looking towards right abutment of dam. Note saplings growing in a row. Concrete pipe for gate valve on high level inlet used for water supply can be seen in rear.

US ARMY ENGINEER DIV. NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS

LENARD-DILAJ ENGINEERING, INC.
STORRS, CONNECTICUT
ENGINEER

NATIONAL PROGRAM OF
INSPECTION OF
NON-FED. DAMS

HALCHEK POND DAM
WILLINGTON, CONNECTICUT

CT 00677

JAN. 1981

C-4



Photo 7. High level outlet used for water supply on downstream face of dam near right abutment. Hoses are used for filling water trucks.



Photo 8. Low level outlet structure approximately 2'x 2' at toe of downstream embankment. Note cobbles which could block flow from this opening.

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	HALCHEK POND DAM WILLINGTON, CONNECTICUT CT 00677 JAN. 1981 C-5
LENARD-DILAJ ENGINEERING, INC. STORRS, CONNECTICUT ENGINEER		



Photo 9. Ponded seepage at toe of downstream slope on left side of dam surrounded by cobbles and small boulders.



Photo 10. Seepage at toe of downstream slope near the spillway channel at the left side of the dam.

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	HALCHEK POND DAM WILLINGTON, CONNECTICUT
LENARD-DILAJ ENGINEERING, INC. STORRS, CONNECTICUT ENGINEER		CT 00677 JAN. 1981 C-6

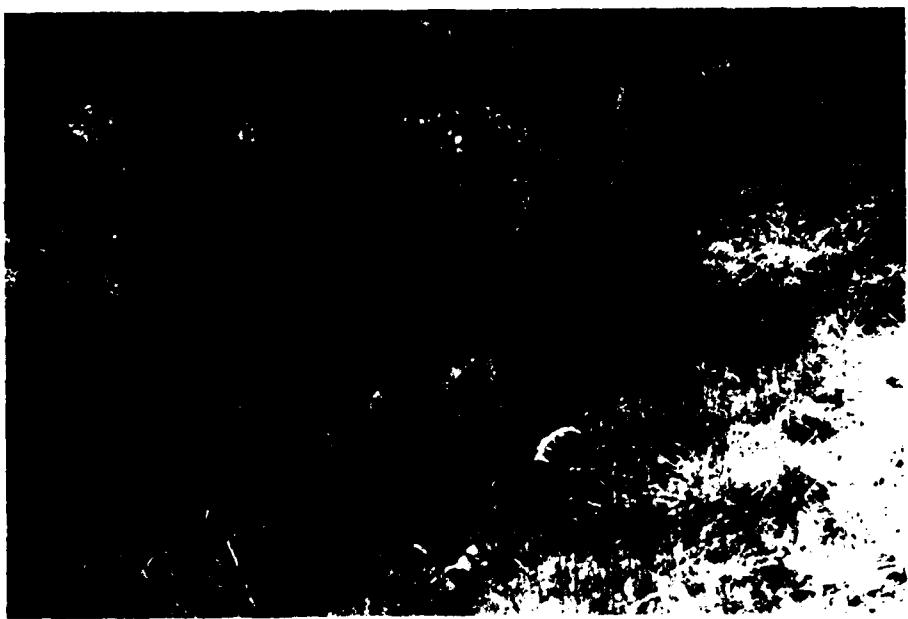


Photo 11

Downstream slope and toe near right side of dam. From toe of slope downstream, the whole area is wet with a rust colored and oily sheen. Slopes of downstream face are dry. Note trees indicating original ground level.



Photo 12.

Seep at center of downstream toe of dam. There is visible flow, with a rusty and oily sheen on the water.

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CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS

LENARD-DILAJ ENGINEERING, INC.
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ENGINEER

NATIONAL PROGRAM OF
INSPECTION OF
NON-FED. DAMS

HALCHEK POND DAM
WILLINGTON, CONNECTICUT
CT 00677
JAN. 1981
C-7

APPENDIX D

**HYDROLOGIC AND HYDRAULIC
COMPUTATIONS**

LENARD & DILAJ ENGINEERING, INC.
1066 Storrs Road
STORRS, CONNECTICUT 06268
(203) 429-7308

JOB Contract No. DACW33-81-C-0014

SHEET NO. _____ OF _____
CALCULATED BY K. A. DATE 2/11/81
CHECKED BY _____ DATE _____
SCALE None

HALCHER POND DAM

DETERMINATION OF SPILLWAY TEST FLOOD*

A. SIZE CLASSIFICATION

Based on either storage or height

THIS DAM:

<u>Small</u>	Storage 50-999 Ac.-Ft. Height 25-39 Ft.	<u>154 Ac.Ft.</u> <u>27 FT.</u>
<u>Intermediate</u>	Storage 1,000-50,000 Ac.Ft. Height 40-100 Ft.	_____
<u>Large</u>	Storage More than 50,000 Ac.-Ft. Height Greater than 100 Ft.	_____

B. HAZARD POTENTIAL CLASSIFICATION

<u>Category</u>	<u>Loss of Life</u>	<u>Economic Loss</u>
Low	None expected	Minimal
<u>Significant</u>	<u>Few</u>	<u>Appreciable</u>
High	More than few	Excessive

Hazard Classification SIGNIFICANT

C. HYDROLOGIC EVALUATION GUIDELINES

<u>Hazard</u>	<u>Size</u>	<u>Spillway Test Flood</u>
Low	Small Intermediate Large	50 to 100-Year Frequency 100-Year Frequency to $\frac{1}{2}$ PMF $\frac{1}{2}$ PMF to PMF
<u>Significant</u>	<u>Small</u> Intermediate Large	<u>100-Year Frequency to $\frac{1}{2}$ PMF</u> $\frac{1}{2}$ PMF to PMF PMF
High	Small Intermediate Large	$\frac{1}{2}$ PMF to PMF PMF PMF

Spillway Test Flood $\frac{1}{2}$ PMF

* Based upon "Recommended Guidelines for Safety Inspection of Dams" Department of the Army, Office of the Chief of Engineers, November 1976.

LIMITS OF WATERSHED

HALCHEK POND DAM

LEONARD-DILAJ ENGINEERING, INC. US ARMY ENGINEER DIV. NEW ENGLAND
STORES, CORRECTIONAL ENGINEERS CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

WATERSHED MAP

HALCHEK POND DAM

WILLINGTON, CONNECTICUT

DRAWN BY E.D. CHECKED BY R.A. APPROVED BY J.L. DATE JAN 31 2000
SCALE: 1" = 2000'

Q4160 02/05/01.

WALCHEK POND DAM WILLINGHORN CONNECTICUT
80-27-9 MAY 1981 DESIGN DRAWINGS

JANUARY 1981 DESE16A S10RAH

NO	NMR	NMIN	IDAY	1MM	1MIN	METRC	IPLT	IPRT	NSTAN
150	0	30	0	0	0	0	0	4	0
			JOPER	N* T	LROP	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN = 1 NRTIO = 6 LRTIO = 1
RTIOS = .10 .20 .30 .50 .80 1.00

SILVER BIRCH COMBINATION

LOCATION OF INFLOW TO HALCHEK POND									
ISTAQ	ICOMP	IECON	ITAPE	JPRT	I NAME	ISAME	IAUTO	LOCAL	Q
1	0	0	0	1	0	0	0	0	0
HYDROGRAPH DATA									
IUHG	TAREA	SNAP	THSDA	TRSPC	ratio	ISNOW	ISAME	LOCAL	Q
1	1.55	0.00	1.55	0.00	0.000	0	0	0	0
PRECIP DATA									
PFE	PMS	R6	R12	R24	R48	R72	R96	R96	R96
.00	23.80	100.00	111.00	120.00	127.00	0.00	0.00	0.00	0.00

	STK#	DLTKR	RTROL	ERAIN	LOSS DATA	RTOK	STRTL	CNSTL	ALSMX	RTIMP
ROPT	0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00

$$TP = 2.35 \quad CP = .63 \quad NTA = 0$$

UNIT HYDROGRAPH 26 END-OF-PERIOD ORDINATES. LAG= 2.36 HOURS. CP= .63 VOL= 1.00
 23. 84. 164. 232. 265. 248. 203. 161. 128.
 60. 64. 51. 40. 32. 25. 20. 16. 13.
 8. 6. 5. 4. 3. 3.
 STRT= -1.00 QHCSN= -.05 RTI= 1.00

HYDROGRAPH ROUTING

ROUTED FLOWS THROUGH HALCHEK POND DAM AND SPILLWAYS

	1STAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	I NAME	I STAGE	I AUTO
QLOSS	2	1	0	0	2	0	0	0	0
				ROUTING DATA					
	0.0	0.000	0.0	IRES ISAME	IOP1	IPMP	LSTR		
					0	0			0
NSTPS	NSTDL	NSTDL	LAG	AWSKK	X	TSK	STORA	ISPRAT	
1	1	0	0	0.000	0.000	0.000	-668.	-1	
STAGE	668.00	669.00	670.00	670.30	670.90	672.00	673.00	674.00	676.00
FLOW	678.00	680.00							
	0.00	53.00	150.00	185.00	423.00	739.00	1147.00	1670.00	1971.00
	5051.00	7355.00							
SURFACE AREA=	9.	11.	12.	13.	15.	16.	17.		
CAPACITY=	0.	20.	42.	68.	95.	126.	159.		
ELEVATION=	668.	670.	672.	674.	676.	678.	680.		
CREL	SPWID	COOW	EPW	ELEV.	COOL.	CAREA	EXPL		
668.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
TOPEL	DAM DATA								
	COAD	EXPD	DAMID						
	674.4	2.6	1.5	678.					

(2)

OVN

PEAK OUTFLOW IS

1620. AT TIME 42.50 HOURS

• 304

STATION 2

INFLOW: OUTFLOW(8) AND OBSERVED FLOW(10)

The figure is a scatter plot with 'INFLOW (mm)' on the horizontal axis and 'OBSERVED FLOW (mm)' on the vertical axis. Both axes have major tick marks at intervals of 200, starting from 0. A grid of dotted lines is overlaid on the plot area. Numerous small dots represent individual data observations, forming a dense cloud that generally follows the 1:1 diagonal line where inflow equals observed flow.

5.30 591
6.00 601
6.30 611
7.00 621
7.30 6301
8.00 6401
8.30 65.01
9.00 66.01
9.30 67.01
10.00 68.01
10.30 69.01
11.00 70.01
11.30 71.01
12.00 72.01
12.30 73.01
13.00 74.
13.30 75.
14.00 76.
14.30 77.
15.00 78.
15.30 79.
16.00 80.
16.30 81.
17.00 82.
17.30 83.
18.00 84.
18.30 85.
19.00 86.
19.30 87.
20.00 88.
20.30 89.
21.00 90.
21.30 91.
22.00 92.
22.30 93.
23.00 94.
23.30 95.
0.00 96.
.30 97.
1.00 98.
1.30 99.
2.00 100.
2.30 101.
3.00 102.
3.30 103.
4.00 104.
4.30 105.
5.00 106.
5.30 107.
6.00 108.
6.30 109.
7.00 110.
7.30 111.
8.00 112.
8.30 113.
9.00 114.
9.30 115.
10.00 116.
10.30 117.
11.00 118.
11.30 119.
12.00 120.
12.30 121.
13.00 122.
13.30 123.
14.00 124.
14.30 125.
15.00 126.
15.30 127.
16.00 128.
16.30 129.

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
 AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	ARFA	PLAN	RATIO 1	RATIOS APPLIED TO FLOWS				
					RATIO 10	RATIO 2	RATIO 3	RATIO 4	RATIO 5
<u>HYDROGRAPH AT</u>									
1	1.55	1	329.	558.	987.	1645.	2633.	3291.	
	(4.01)	(9.32)	(16.64)	(27.95)	(46.59)	(74.55)	(93.18)		
<u>ROUTED TO</u>									
2	1.55	1	322.	636.	967.	1620.	2604.	3269.	
	(4.01)	(9.13)	(18.00)	(27.37)	(45.87)	(73.75)	(93.12)		

(7)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1	ELEVATION STORAGE OUTFLOW	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM	TIME OF FAILURE HOURS					
					MAXIMUM DEPTH OVER DAM	MAXIMUM STOPAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	MAX OUTFLOW HOURS	
		668.00	668.00	671.40				0.00	42.50	0.00
		0.	0.	671.73.				0.00	42.50	0.00
		0.	0.	1971.				0.00	42.50	0.00
RATIO OF RESERVOIR W.S.ELEV										
.10	670.65	0.00	27.	322.	0.00			42.50	0.00	
.20	671.64	0.00	38.	636.	0.00			42.50	0.00	
.30	672.56	0.00	49.	967.	0.00			42.50	0.00	
.50	673.90	0.00	66.	1620.	0.00			42.50	0.00	
.80	674.76	.36	78.	2604.	2.50			42.00	0.00	
1.00	675.03	.63	82.	3289.	3.50			42.00	0.00	

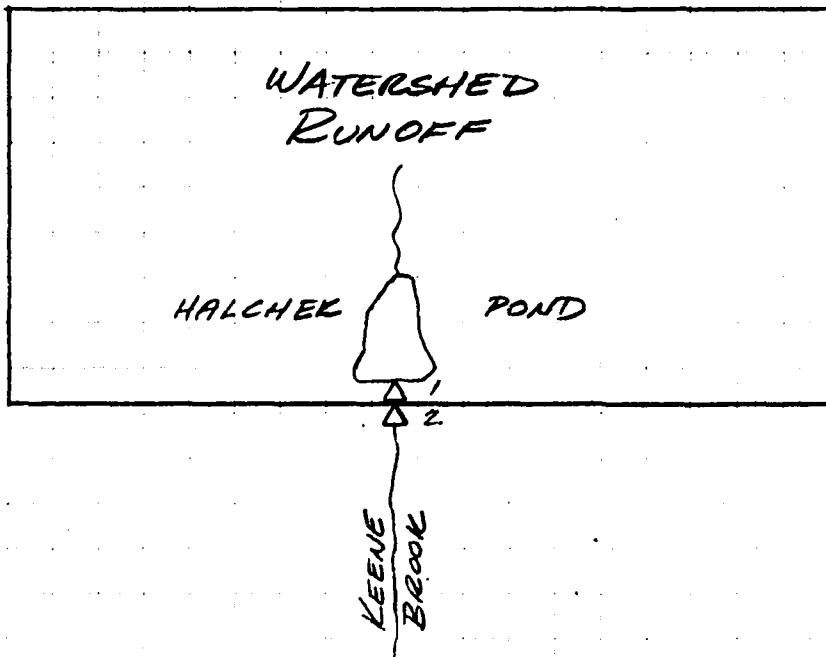


LENARD & DILAJ ENGINEERING, INC.
1066 Storrs Road
STORRS, CONNECTICUT 06268
(203) 429-7308

80-27-9

JOB HALCHEK POND DAM
SHEET NO. 1 OF 9
CALCULATED BY K.A. DATE 1/23/81
CHECKED BY M.R. DATE 1/28/81
SCALE _____

SCHEMATIC



- 1- HALCHEK POND INFLOW
2- " " " ROUTED THROUGH DAM

LENARD & DILAJ ENGINEERING, INC.

1066 Storrs Road
STORRS, CONNECTICUT 06268
(203) 429-7308

JOB HAL CHEK POWL DAM
SHEET NO. 2 OF 9
CALCULATED BY K. A. DATE 1/23/81
CHECKED BY M. R. DATE 1/28/81
SCALE _____

WATERSHED AREA

(STAFFORD SPRINGS QUAD)

5665

4994

671 grads \Rightarrow 1.53 S.M.

4790

4102

688 grads \Rightarrow 1.57 S.M.

3723

3047

676 grads \Rightarrow 1.54 S.M.

1.55 S.M.

WATER SURFACE AREAS

ELEV. 668 (SPILLWAY):

9.2 Ac.

ELEV. 670 :

10.6 Ac.

ELEV. 680 :

17.2 Ac.

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STORRS, CONNECTICUT 06268
(203) 429-7308

JOB HALCHEK POND DAM

SHEET NO. 3 OF 9
CALCULATED BY K. A. DATE 1/23/81
CHECKED BY M.R. DATE 1/28/81

SCALE _____

WATER SURFACE AREAS

ELEVATION

680

680 - * 17.2

678 - * 16

676 - * 14.5

674 - * 13.3

672 - * 12

670 - * 10.6

668 - * 9.2

670

668 SW

660

0

5

10

15

20

ACRES

NOTE: APPROX. STORAGE BELOW SPILLWAY ELEV. = 81 AC.-FT.

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JOB HALCHER KONO DAM
SHEET NO. 4 OF 9
CALCULATED BY K.A. DATE 1/23/81
CHECKED BY M.R. DATE 1/28/81
SCALE _____

PRECIPITATION

U.S. WEATHER BUREAU
TECH. PAPER No. 40

PMF - 6 HOUR

23.8 INCHES

LAG TIME (SNYDER'S)

$$t_p = C_f (L L_{CA})^{0.3}$$

$$C_f = 2.0$$

$$L = 11,350' = 2.15 \text{ MI.}$$

$$L_{CA} = 4250' = 0.80 \text{ MI.}$$

$$t_p = 2.0 [(2.15)(0.80)]^{0.3}$$

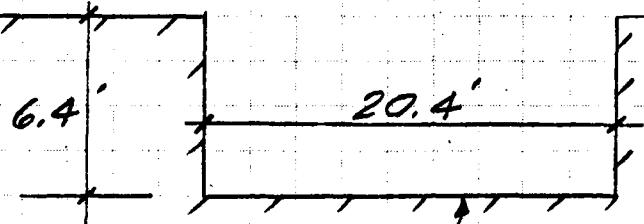
$t_p = 2.35 \text{ HRS.}$

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 STORRS, CONNECTICUT 06268
 (203) 429-7308

JOB HALCHER RIVER DAM
 SHEET NO. 5 OF 9
 CALCULATED BY K. A. DATE 1/23/81
 CHECKED BY MR DATE 1/28/81
 SCALE

SPILLWAY (PRIMARY - No FLASHBOARDS)

TOP DAM
ELEV. 674.4'



$$Q = CLH^{1.5}$$

SPILLWAY CREST
ELEV. 668.0'
(BROAD CREST)

DISCHARGE:

<u>ELEV.</u>	<u>C</u>	<u>L</u>	<u>H</u>	<u>Q (CCFS)</u>
668.0	2.6	20.4	0	0
669.0	2.6		1.0	53
670.0	2.6		2.0	150
670.3	2.6		2.3	185
670.9	2.6		2.9	262
672.0	2.6		4.0	424
673.0	2.6		5.0	593
674.0	2.6		6.0	780
674.4	2.8		6.4	925
676.0	2.8		8.0	1292
678.0	3.0		10.0	1935
680.0	3.0	20.4	12.0	2544

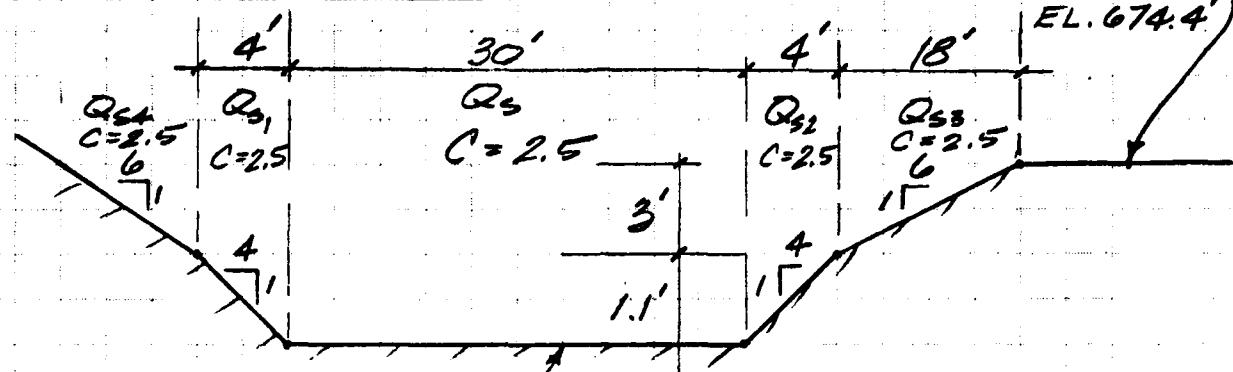
TEST FLOOD LEVEL - $\frac{1}{2}$ PMF

673.9 2.6 20.4 5.9 760

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STORRS, CONNECTICUT 06268
(203) 429-7308

JOB HALCHER YOUNG DAM
SHEET NO. 6 OF 9
CALCULATED BY K. A. DATE 1/26/81
CHECKED BY M.R. DATE 1/22/81
SCALE _____

EMERGENCY SPILLWAY



$$Q_s = CLH^{1.5}$$

$$Q_{s1} = Q_{s2} = CL\left(\frac{H}{2}\right)^{1.5} + H^2 \quad (H \leq 1)$$

$$Q_{s1}' = Q_{s2}' = CL(H-1)^{1.5} + 4.5 \quad (H > 1) \quad (\text{EARTH FILL, BROAD CREST})$$

$$Q_{s3} = CL\left(\frac{H-1}{2}\right)^{1.5} \quad (1 < H \leq 4)$$

$$Q_{s3}' = CL(H-4)^{1.5} + 83 \quad (H > 4)$$

$$Q_{s4} = CL\left(\frac{H-1}{2}\right)^{1.5} \quad (H > 1)$$

SPILLWAY CREST

ELEV. 670.3'

DISCHARGE: (IN CFS)

ELEV.	H	Q_s	Q_{s1}/Q_{s1}'	Q_{s2}/Q_{s2}'	Q_{s3}/Q_{s3}'	Q_{s4}	Q_{TOTAL}
670.3	0	0	0	0	0	0	0
670.9	0.6	35	2	2	0	0	39
672.0	1.7	166	10	10	2	2	190
674.0	3.7	534	49	49	64	64	760
674.4	4.1	623	59	59	84	90	915
676.0	5.7	1021	106	106	183	254	1670
678.0	7.7	1602	178	178	403	616	2977
680.0	9.7	2266	261	261	695	1184	4667
673.0	2.7	333	27	27	20	20	427

TEST FLOOD LEVEL - $\frac{1}{2}$ PMF

673.9	3.6	512	46	46	56	56	716
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LENARD & DILAJ ENGINEERING, INC.

1066 Storrs Road
STORRS, CONNECTICUT 06268
(203) 429-7308

JOB HALCHER RIVER LAM

SHEET NO. 7 OF 9
CALCULATED BY K.A. DATE 1/20/81
CHECKED BY M.R. DATE 1/20/81
SCALE

LOW LEVEL OUTLET

CONTROL: Box Culvert 2'W x 2'H

$$Q = A \sqrt{\frac{2gH}{K}}$$

$$A = W \times H = 4 \text{ FT.}^2$$

$$g = 32.2 \text{ FT/S}^2$$

$$K = 1.6$$

DISCHARGE:

ELEV.	A	g	K	H	Q (CFS)
670.9	4	32.2	1.6	22	119
672.0				23.1	122
673.0				24.1	125
674.0				25.1	127
674.4				25.5	128
676.0				27.1	132
678.0				29.1	137
680.0	4	32.2	1.6	31.1	142

TEST FLOOD LEVEL - 1/2 PMF

673.9 4 32.2 1.6 25.0 111

NOTE: INVERT ELEV. = 647.9'
CENTER LINE ELEV. = 648.7'

LENARD & DILAJ ENGINEERING, INC.
1066 Storrs Road
STORRS, CONNECTICUT 06268
(203) 429-7308

JOB HOLCHEK POND DAM
SHEET NO. S OF ?
CALCULATED BY K.A. DATE 1/26/81
CHECKED BY M.R. DATE 1/20/81
SCALE _____

DISCHARGE SUMMARY

ELEV.	Q PR. SW.	Q EM. SW.	Q CULVERT	Q TOTAL
668.0	0	0	0	0
669.0	53	0	0	53
670.0	150	0	0	150
670.3	185	0	0	185
670.9	262	39	119	420
672.0	424	190	122	736
673.0	593	427	125	1145
674.0	780	760	127	1667
674.4	925	915	125	1065
676.0	1292	1670	132	3094
678.0	1935	2977	137	5049
680.0	2544	4667	142	7353

TEST FLOOD LEVEL - $\frac{1}{2}$ PMF

673.9 760 716 127 1603

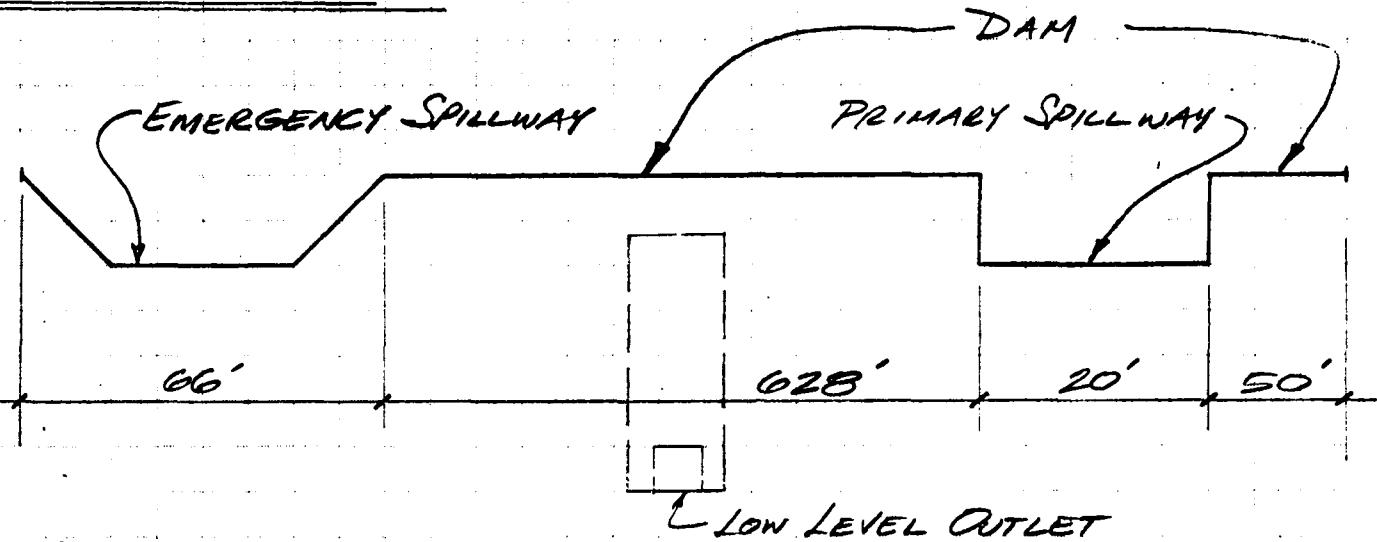
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(203) 429-7308

JOB HALCHEK FUND DAM

SHEET NO. 9 OF 9
CALCULATED BY K. A. DATE 1/26/81
CHECKED BY M.R. DATE 1/20/81
SCALE _____

DAM LENGTH



$$\text{DAM LENGTH} = \text{TOTAL} - \text{SPILLWAYS}$$

$$L = 628' + 50'$$

$$\underline{L = 678'}$$

DISCHARGE COEFFICIENT OVER DAM

$$\underline{C = 2.6}$$

ELEVATIONS

TOP DAM: 674.4'

TOP OUTLET STRUCTURE: 670.9'

PRIMARY SPILLWAY CREST: 668.0'

EMERGENCY SPILLWAY CREST: 670.3'

INVERT OF BOX CULVERT OUTLET: 647.9'

HEIGHT OF DAM: 26.5'

LENARD & DILAJ ENGINEERING, INC.

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(203) 429-7308

JOB HACCIERI AND DAM
SHEET NO. 1 OF 19
CALCULATED BY MTR DATE 1/30/81
CHECKED BY K.A. DATE 2/12/81
SCALE _____

DAM FAILURE ANALYSIS

DAM LENGTH = 764'

DAM LENGTH AT MID HEIGHT = 540'

PEAK FAILURE OUTFLOW

$$Q_{P1} = \frac{2}{3} \pi w_b \sqrt{g} Y_o^{3/2}$$

$$w_b = 0.4 \times 540' = 216'$$

$$g = 32.2 \text{ ft/lb}$$

$$Y_o = 26.5'$$

$$Q_{P1} = \frac{2}{3} \pi (216) \sqrt{32.2} (26.5)^{3/2}$$

$$Q_{P1} = 49,542 \text{ cfs}$$

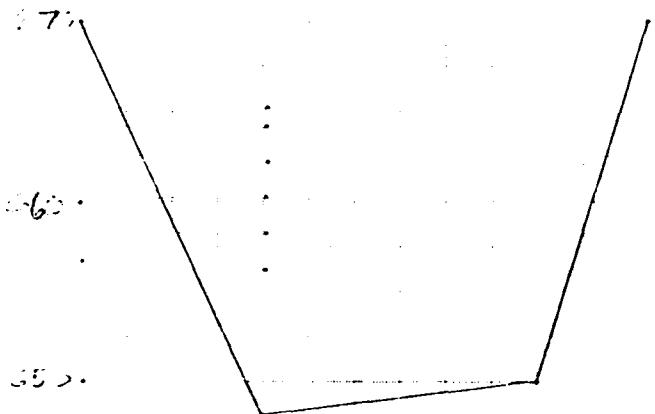
STORAGE:

154 Ac - F+

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JOB 100-100-1
SHEET NO. 2 OF 19
CALCULATED BY L.S. DATE 1-1-71
CHECKED BY K.A. DATE 2/12/81
SCALE _____

SECTION 1STATION 4+00

17'
16'
35'
36'

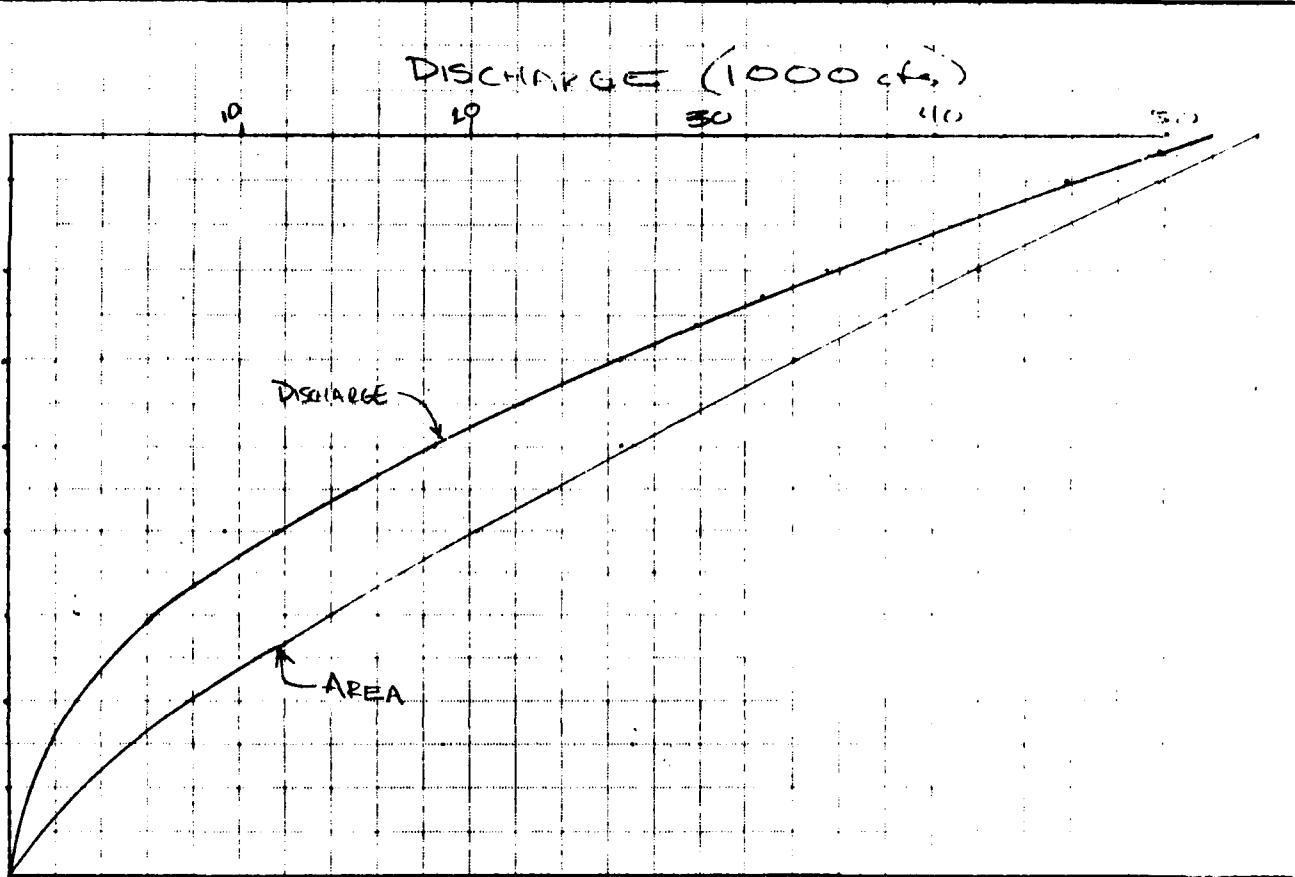
A = 2.1
C = 0.00000
L = +1.1

H	A	WP	R	V	Q
5	2510	410	6.1	4.7	11,572
10	3360	440	7.6	5.5	12,000
12	4270	470	9.1	6.2	12,724
14	5240	500	10.5	6.8	13,534
16	6210	530	11.8	7.5	14,471
17	6810	550	12.4	7.9	15,400

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JOB HALCIEK POND DAM
 SHEET NO. 3 OF 19
 CALCULATED BY MIZ DATE 1/21/81
 CHECKED BY K.A. DATE 2/12/81

SECTION 1



$$Q_{P1} = 49,542 \text{ cfs}$$

$$H_1 = 16.6 \text{ ft}$$

$$A_1 = 6600 \text{ sq ft}$$

$$V_1 = 61 \text{ Ac ft.}$$

$$Q_{P2(\text{TRIAL})} = 29,918$$

$$H_2(\text{TRIAL}) = 12.7 \text{ ft}$$

$$A_2(\text{TRIAL}) = 4650 \text{ sq ft}$$

$$V_2(\text{TRIAL}) = 43 \text{ Ac ft}$$

$$Q_{P2} = 32,814 \quad H_2 = 13.4$$

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JOB 111-1
 SHEET NO. 41 OF 19
 CALCULATED BY 111
 CHECKED BY L.A. DATE 2/12/81
 SCALE _____

670-

660-

650-

SECTION 2Symmetrical

N = 1
 $E = 0.015$
 $\sigma_c = 42,586$

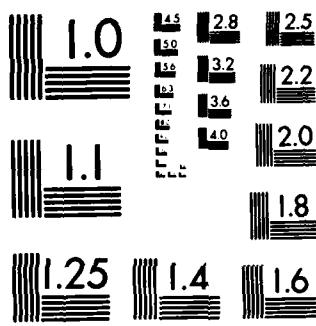
H	I	K	L	M	N
6	2,000	3,000	4,000	4.8	9981
8	4,000	5,000	6,000	6.0	18,661
10	6,000	6,000	7,000	7.1	29,778
12	8,000	5,000	6,000	8.0	42,586

RD-R144 582 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS 2/2
HALCHEK POND DAM (CT.) (U) CORPS OF ENGINEERS WALTHAM MA
NEW ENGLAND DIV MAR 81

UNCLASSIFIED

F/G 13/13 NL

END
ENR MED
DTIR



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

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(203) 429-7308

JOB 11-1
SHEET NO. 4 OF 19
CALCULATED BY L.A.
CHECKED BY DATE 2/12/81
SCALE

670-660-650-SECTION 2Storrs, Conn. 06268

N. 1
0.015
C.C.

H	I	K	V	W
6	2.000	2.00	4.8	9981
8	1.500	5.00	6.0	18,661
10	1.330	6.25	7.1	29,778
12	1.250	5.00	8.0	42,586

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STORRS, CONNECTICUT 06268
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JOB HALCHIEK POND D.111

SHEET NO. 5 OF 19
CALCULATED BY M.R. DATE 1/30/81
CHECKED BY K.A. DATE 2/12/81

SECTION 2

DISCHARGE (1000 cfs)

10 20 30 40 50

16

14

12

10

8

6

4

2

0

DISCHARGE

AREA

2 3 4 5 6
AREA (1000 ft²)

$$Q_{P2} = 32,814 \text{ cfs}$$

$$Q_{P3} (\text{TR.AC}) = 23,865 \text{ cfs}$$

$$H_2 = 10.5 \text{ ft}$$

$$H_3 (\text{TR.AC}) = 9.0 \text{ ft}$$

$$A_2 = 4550.92 \text{ ft}^2$$

$$A_3 (\text{TR.AC}) = 3720.58 \text{ ft}^2$$

$$V_2 = 42 \text{ Ac.ft.}$$

$$V_3 (\text{TR.AC}) = 34 \text{ Ac.ft.}$$

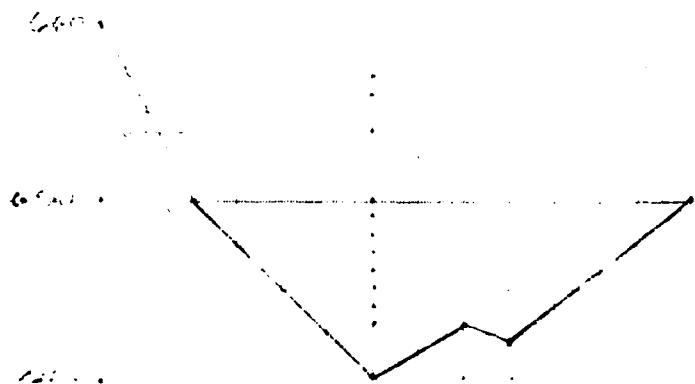
$$Q_{P3} = 24,717 \text{ cfs}$$

$$H_3 = 9.2 \text{ ft}$$

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JOB 6
SHEET NO. 6 OF 19
CALCULATED BY K. A. DATE 2/12/81
CHECKED BY DATE
SCALE

SECTION 4.3STATION 11+00

C.I.
0.0 79
3000

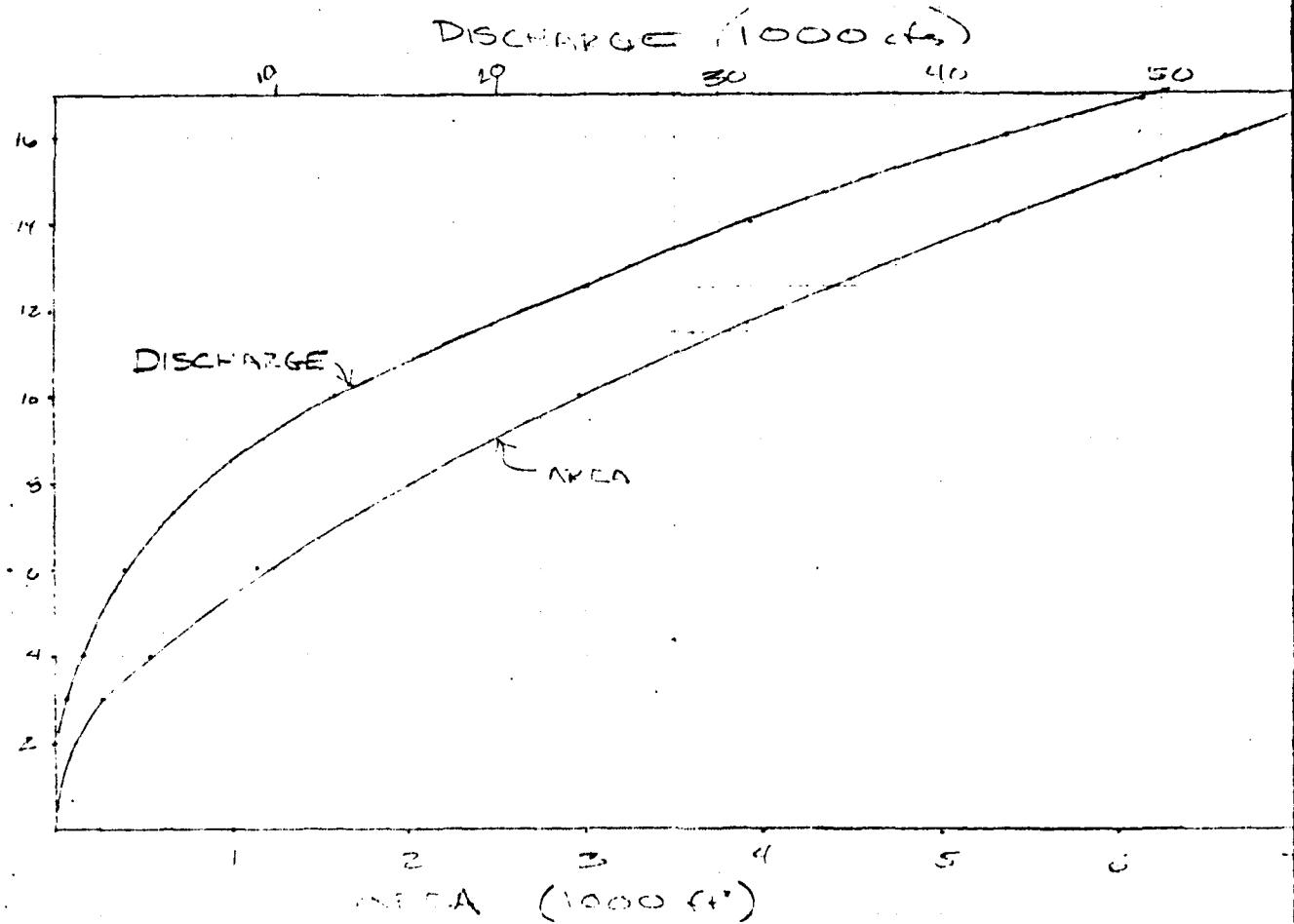
	A	B	C	D	E
1	275	260	1.0	1.0	
2	325	270	1.7	2.2	
3	315	310	2.0	2.7	
4	455	370	3.1	3.7	
5	2995	550	5.1	4.3	12.378
10	5335	620	8.6	5.9	31.476
14	6625	670	9.3	6.5	43.362
16	7305	690	10.6	6.8	47.574

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JOB HALC HEN SHEET NO. 7 OF 19
CALCULATED BY M.R. DATE 1/30/81
CHECKED BY K.A. DATE 2/12/81
SCALE _____

SECTION 3



$$Q_{D3} = 24.717 \text{ cfs}$$

$$H_3 = 13.7 \text{ ft.}$$

$$A_3 = 4500 \text{ sq.ft.}$$

$$V_3 = 31 \text{ ft./sec.}$$

$$Q_{D4} (\text{TRIAL}) = 19.742 \text{ cfs}$$

$$H_4 (\text{read}) = 11.6 \text{ ft.}$$

$$A_4 (\text{read}) = 3900 \text{ sq.ft.}$$

$$V_4 (\text{TRIAL}) = 27 \text{ ft./sec.}$$

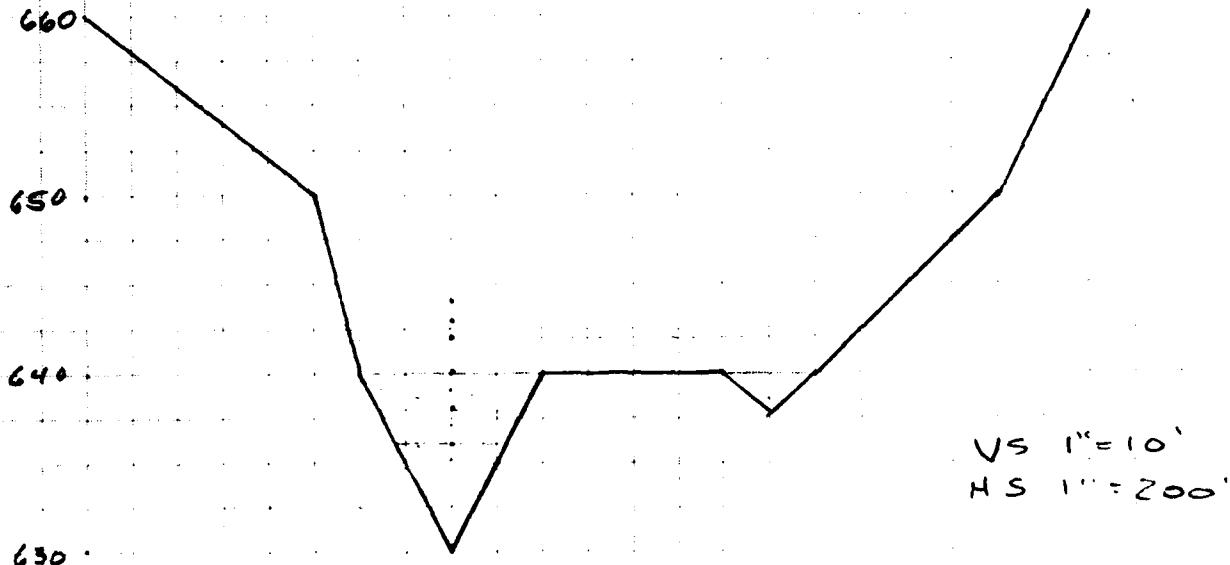
$$Q_{D4} = 20,063 \text{ cfs} \quad H_4 = 11.8 \text{ ft.}$$

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JOB HALCHIER RIVER DAM
 SHEET NO. 8 OF 19
 CALCULATED BY MR DATE 2/12/81
 CHECKED BY K.A. DATE 2/12/81
 SCALE _____

SECTION # 4

STATION 16+50



$$\begin{aligned} n &= 0.10 \\ S &= 0.018 \text{ ft}^{-1} \\ L &= 550 \text{ ft} \end{aligned}$$

H	A	WP	R	V	Q
6	360	120	3.0	4.2	1512
8	640	160	4.0	5.0	3,260
10	1100	300	3.7	4.0	5,280
12	2150	550	3.9	5.0	10,750
13	2710	570	4.8	5.7	15,447
14	3295	600	5.5	6.2	20,429

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JOB HALCHERK POND DAM
SHEET NO. 9 OF 19
CALCULATED BY M.R. DATE 1/30/81
CHECKED BY K.A. DATE 2/12/81
SCALE _____

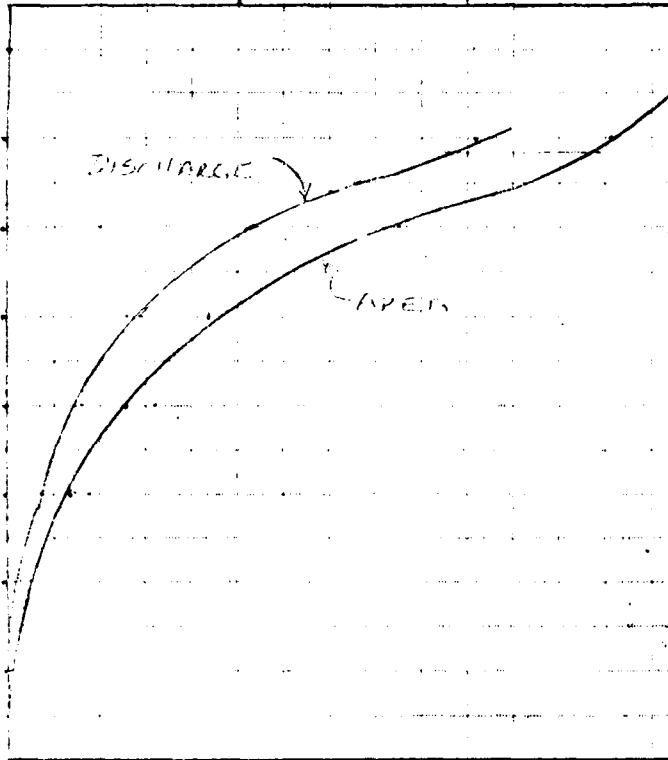
SECTION = 4

DISCHARGE (1000 cfs)

10 19 30 40 50

DISCHARGE

AREA

2 3 4 5 6
AREA (1000 ft²)

$$Q_{pu} = 20,063 \text{ cfs}$$

$$C_p (TRIAL) = 4,722 \text{ cfs}$$

$$t_{tr} = 13.8 \text{ s}$$

$$t_5 (TRIAL) = 12.9 \text{ ft}$$

$$A_5 = 2,650 \text{ sq ft}$$

$$t_5 (TRIAL) = 2,300 \text{ sq ft}$$

$$V_4 = 41 \text{ A. ft.}$$

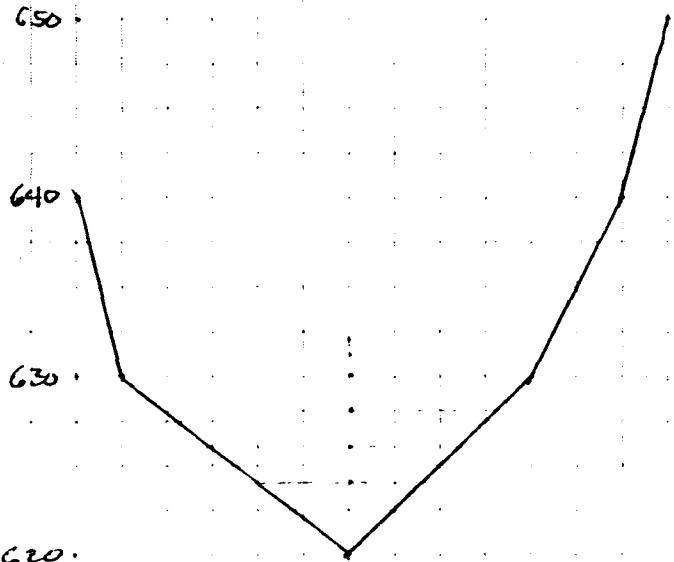
$$V_5 (TRIAL) = 35 \text{ A. ft.}$$

$$\therefore Q = 15,117 \text{ cfs} \quad t_5 = 13.0 \text{ ft.}$$

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JOB HALCHER THIRD DAM
 SHEET NO. 10 OF 19
 CALCULATED BY MR DATE 2/12/81
 CHECKED BY K. A. DATE 2/12/81
 SCALE _____

SECTION #5 STATION 25+50



$$n = 0.05$$

$$S = 0.011$$

$$L = 900$$

$$VS 1'' = 10'$$

$$HS 1'' = 200'$$

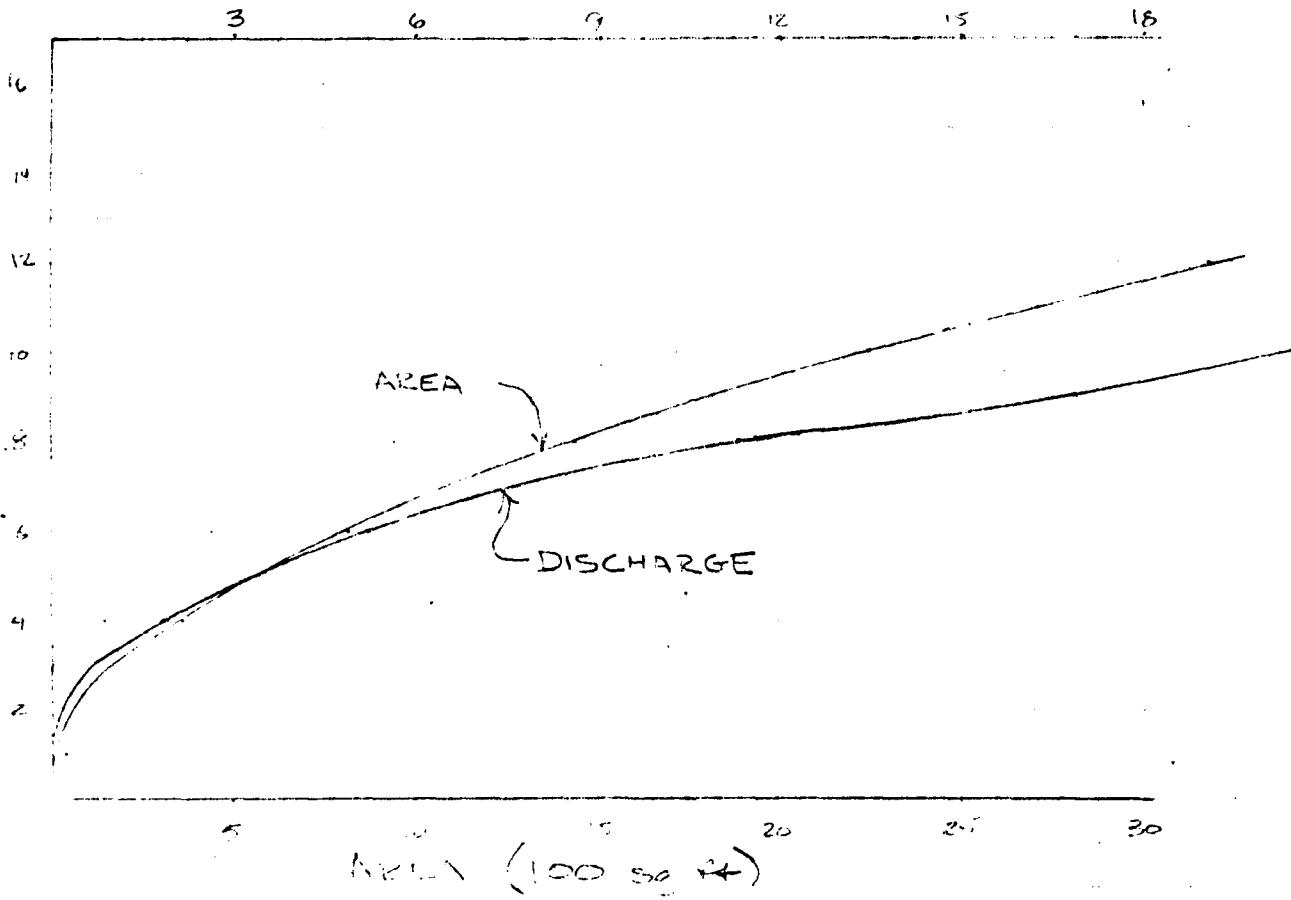
H	A	WP	R	V	Q
4	360	180	2.0	5.0	1800
6	810	270	3.0	6.5	5,205
8	1440	360	4.0	7.9	11,376
10	2250	450	5.0	9.1	20,475
11	2710	470	5.8	10.1	27,371
12	3185	480	6.6	11.0	35,035

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SECTION #5

JOB HILCHEK AND DAM
SHEET NO. 11 OF 19
CALCULATED BY M.R. DATE 2/2/31
CHECKED BY K.A. DATE 2/12/81
SCALE _____

DISCHARGE (1000 cfs)



$$Q_{av} = 15,112 \text{ cfs}$$

$$H_c = 8.6 \text{ ft}$$

$$A_s = 1657 \text{ sq ft}$$

$$V_a = 34 \text{ Ac. ft.}$$

$$Q_{av} (\text{ft}^3/\text{sec}) = 11,776 \text{ cfs}$$

$$H_c (\text{ft}^3/\text{sec}) = 8.1 \text{ ft}$$

$$A_s (\text{ft}^2) = 1450 \text{ sq ft}$$

$$V_a (\text{ft}^3) = 30 \text{ Ac. ft}$$

$$Q_{av} = 11,772 \text{ cfs} \quad H_c = 8.1 \text{ ft}$$

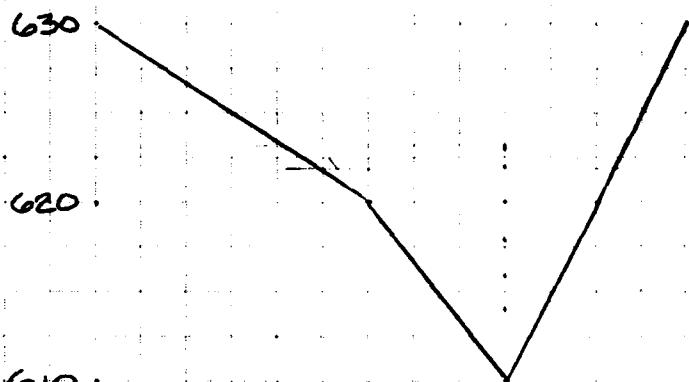
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(203) 429-7308

JOB HALCHEK FUND DAM
SHEET NO. 12 OF 19
CALCULATED BY MR K.A. DATE 2/2/81
CHECKED BY K.A. DATE 2/12/81
SCALE _____

SECTION # 6

STATION 33+50



$$\begin{aligned} n &= 0.10 \\ S &= 0.013 \\ L &= 800 \end{aligned}$$

V.S. 1" = 10' H.S. 1" = 200'

H	A	WP	R	V	Q
4	200	100	2.0	2.7	540
6	450	150	3.0	3.5	1,575
8	800	200	4.0	4.3	3,440
10	1250	250	5.0	5.0	6,250
12	1864	320	5.8	5.5	11,228
13	2165	360	6.0	5.6	12,152

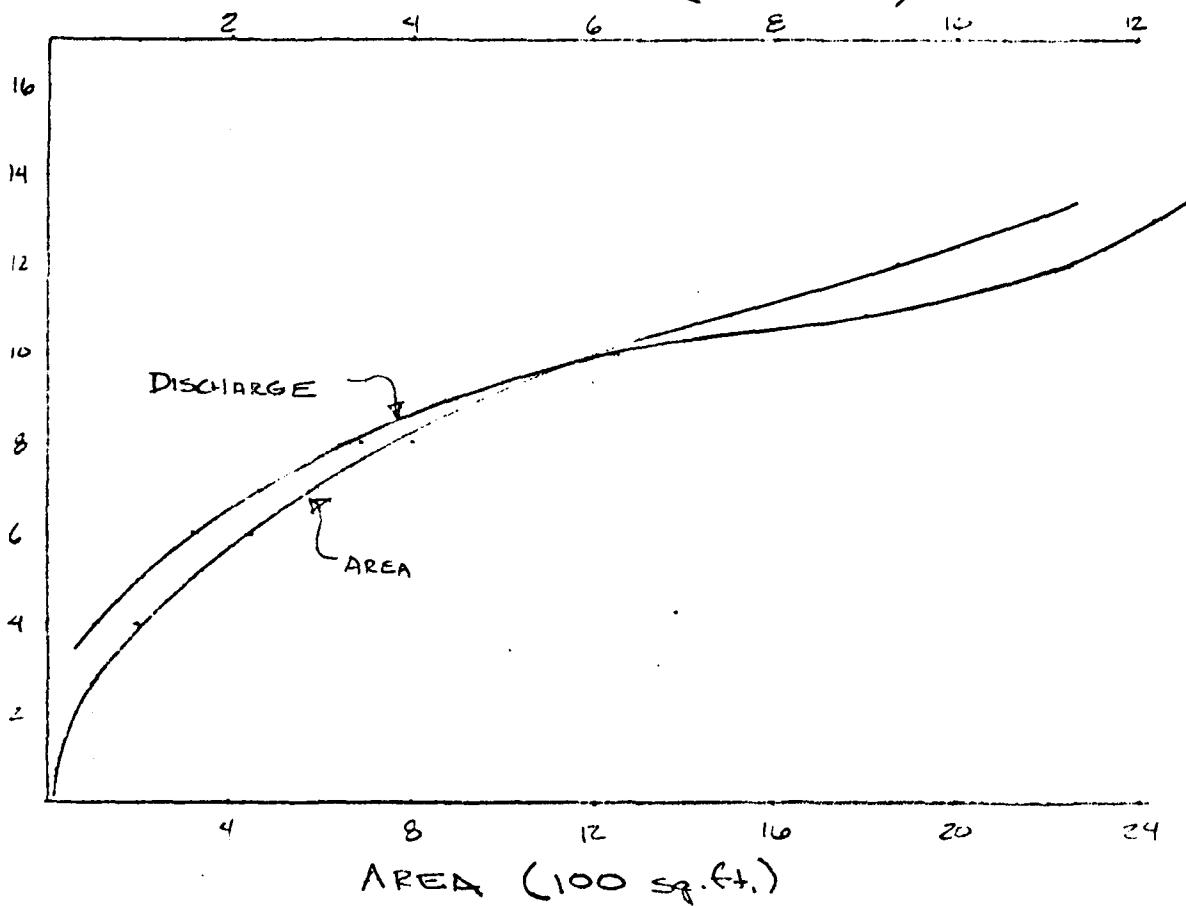
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JOB #1AUCH-15 Fo. - DAM
SHEET NO. 13 OF 19
CALCULATED BY M.R. DATE 2/12/81
CHECKED BY L.A. DATE 2/12/81
SCALE

SECTION #6

DISCHARGE (1000 cfs)



$$Q_{P6} = 11,972 \text{ cfs}$$

$$H_c = 12.8 \text{ ft}$$

$$A_6 = 2070 \text{ sq ft}$$

$$V_c = 38 \text{ Ac. ft}$$

$$Q_{P7} (\text{TRIAL}) = 9018 \text{ cfs}$$

$$H_7 (\text{TRIAL}) = 10.9 \text{ ft}$$

$$A_7 (\text{TRIAL}) = 1500 \text{ sq ft}$$

$$V_7 (\text{TRIAL}) = 28 \text{ Ac. ft.}$$

$$Q_{D7} = 9407 \text{ cfs} \quad H_7 = 11.0 \text{ ft}$$

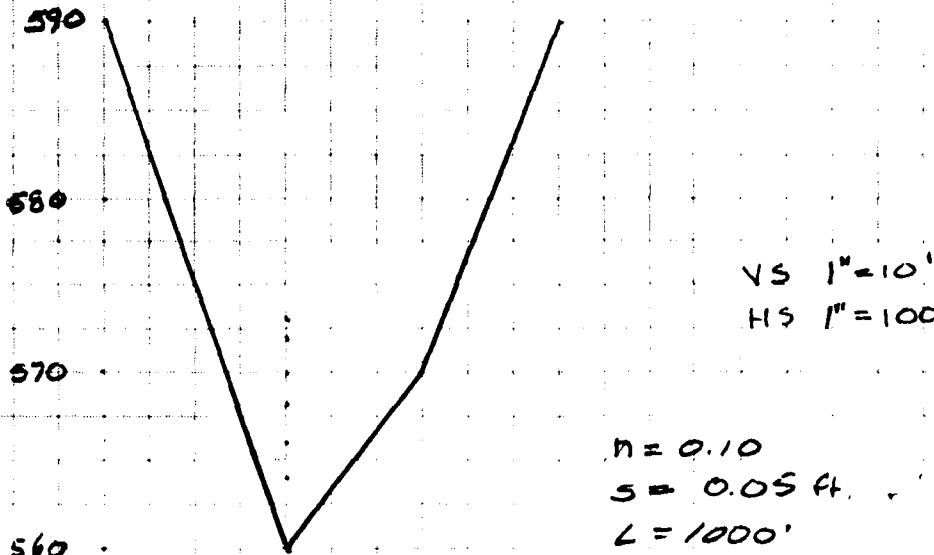
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JOB HAL CHEK POND DAM
SHEET NO. 14 OF 19
CALCULATED BY MR DATE 2/2/81
CHECKED BY K.A. DATE 2/12/81
SCALE

SECTION #7

STATION 43+50



H	A	WP	R	V	Q
4	80	40	2.0	5.3	424
6	180	60	3.0	6.9	1242
8	360	90	4.0	8.4	3024
10	525	105	5.0	9.7	5092
12	750	120	6.25	11.3	8478
13	872	125	7.0	12.2	10,638

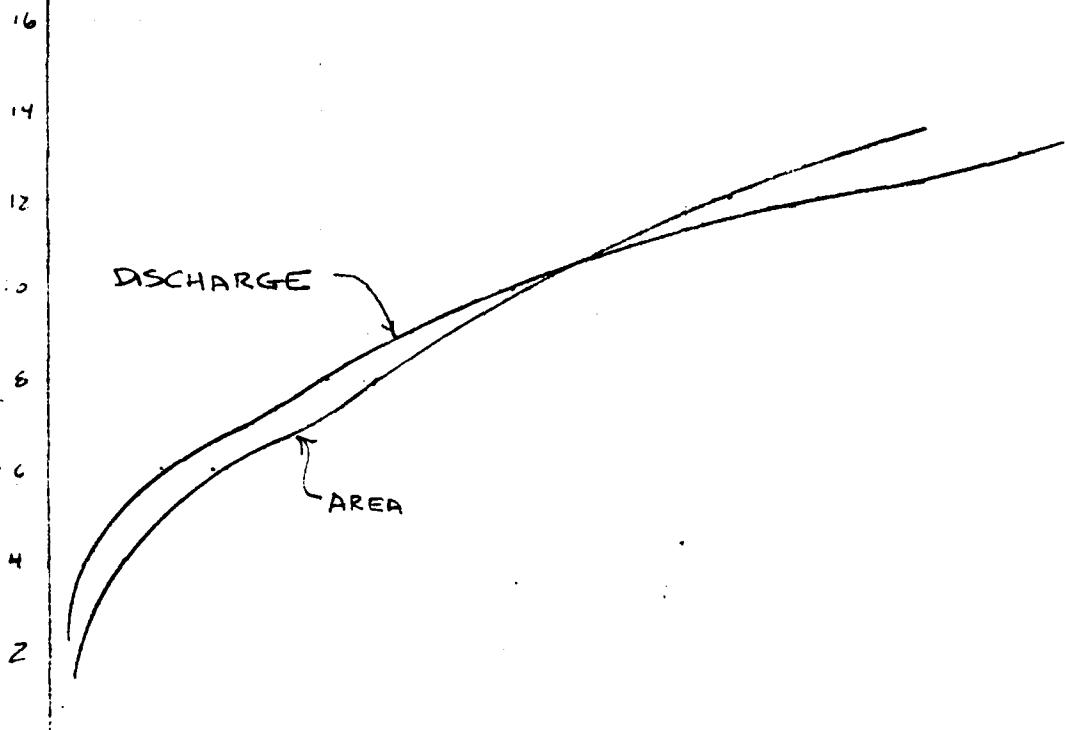
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JOB HALCHIEK THIRD DAM
 SHEET NO. 15 OF 17
 CALCULATED BY MR DATE 2/2/81
 CHECKED BY K.A. DATE 2/12/81

SECTION #7

DISCHARGE (1000 cfs)

2 4 6 8 10 12



AREA (100 sq ft)

$$Q_{P7} = 9407 \text{ cfs}$$

$$H_7 = 12.2 \text{ ft}$$

$$A_7 = 760 \text{ sq ft}$$

$$V_7 = 17 \text{ ac.ft.}$$

$$Q_{P8} (\text{TRIAL}) = 8369 \text{ cfs}$$

$$H_8 (\text{TRIAL}) = 11.7 \text{ ft}$$

$$A_8 (\text{TRIAL}) = 730 \text{ sq ft}$$

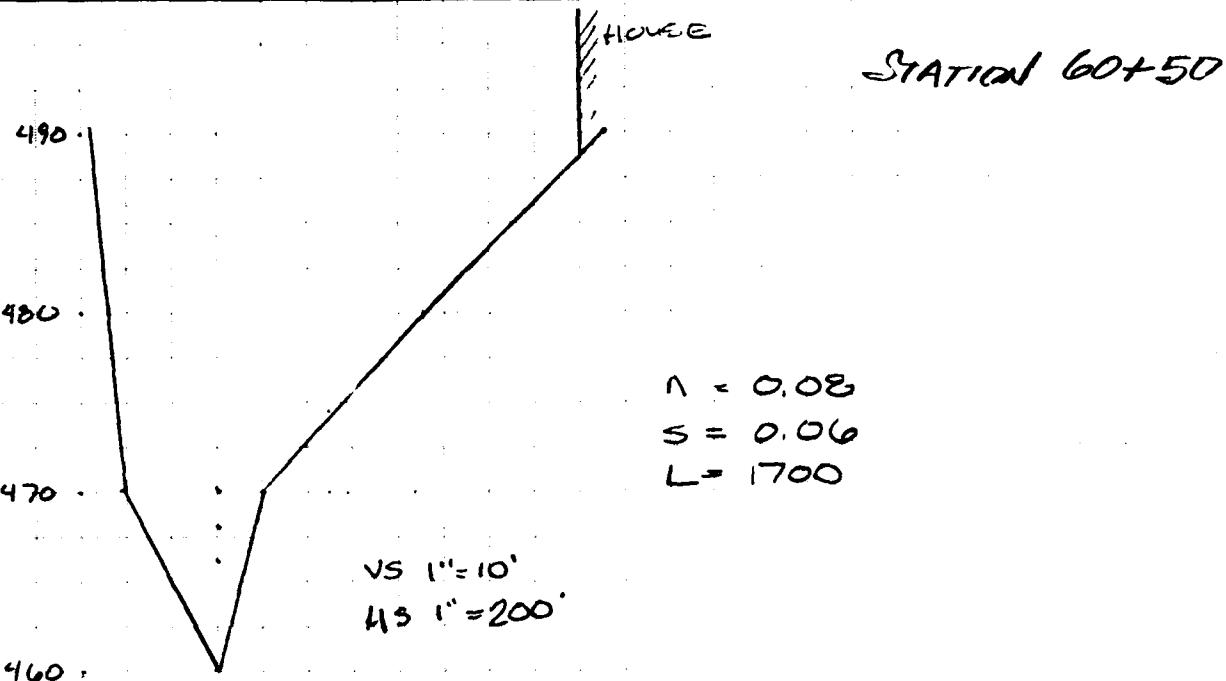
$$V_8 (\text{TRIAL}) = 17 \text{ ac.ft.}$$

$$Q_{P8} = 8369 \text{ cfs} \quad H_8 = 11.9 \text{ ft}$$

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JOB HALCHEK POND DAM
SHEET NO. 16 OF 19
CALCULATED BY MR DATE 2/3/81
CHECKED BY K. A. DATE 2/12/81
SCALE _____

SECTION #8



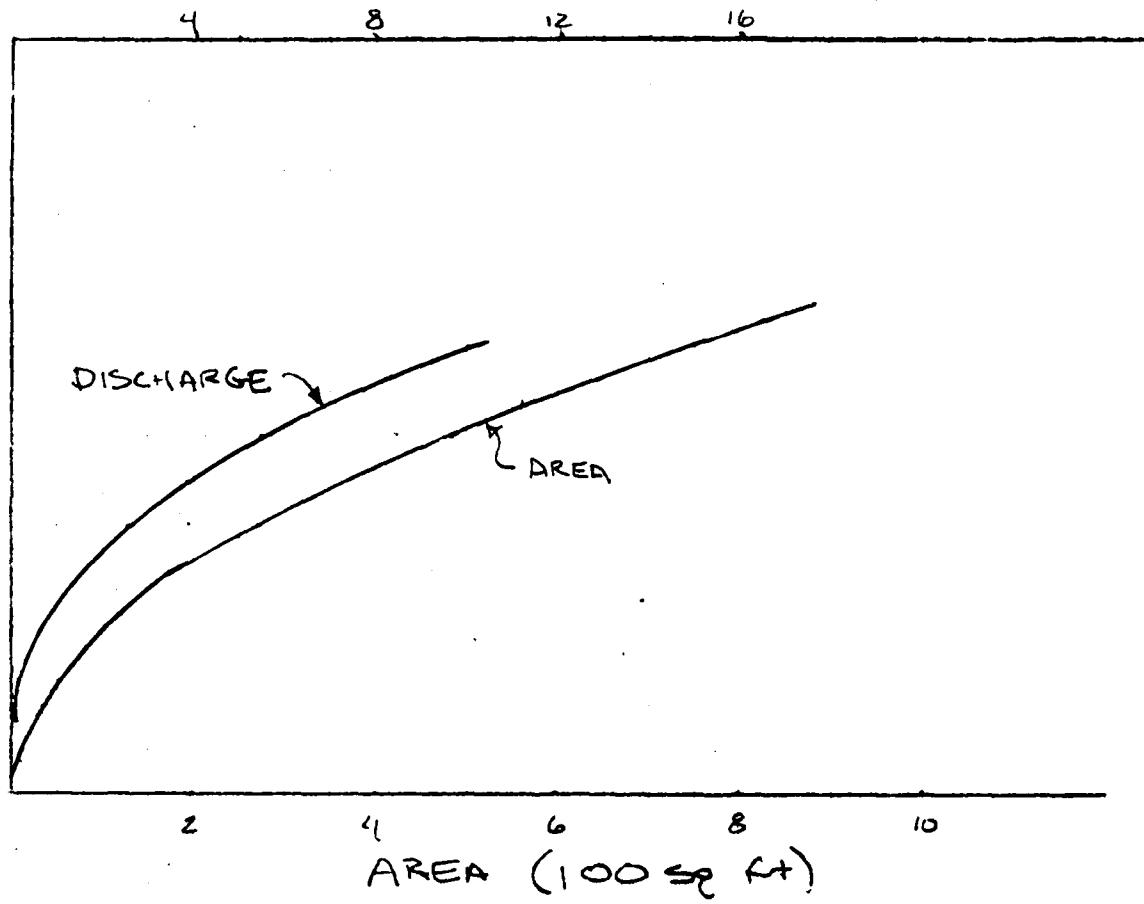
H	A	WP	R	V	Q
6	270	90	3.0	9.5	2563
8	480	120	4.0	11.5	5521
10	750	150	5.0	13.4	10,010

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JOB HALCHEK H. D. DAM
 SHEET NO. 17 OF 17
 CALCULATED BY MR DATE 2/13/81
 CHECKED BY K. A. DATE 2/12/81
 SCALE _____

SECTION 8

DISCHARGE (1000 cfs)



$$Q_{P8} = 8369 \text{ cfs}$$

$$H_8 = 9.3 \text{ ft}$$

$$A_8 = 640 \text{ sq ft}$$

$$V_8 = 25 \text{ Ac ft}$$

$$Q_{P9} (\text{TRIAL}) = 7010$$

$$H_9 (\text{TRIAL}) = 8.7 \text{ ft}$$

$$A_9 (\text{TRIAL}) = 560 \text{ sq ft}$$

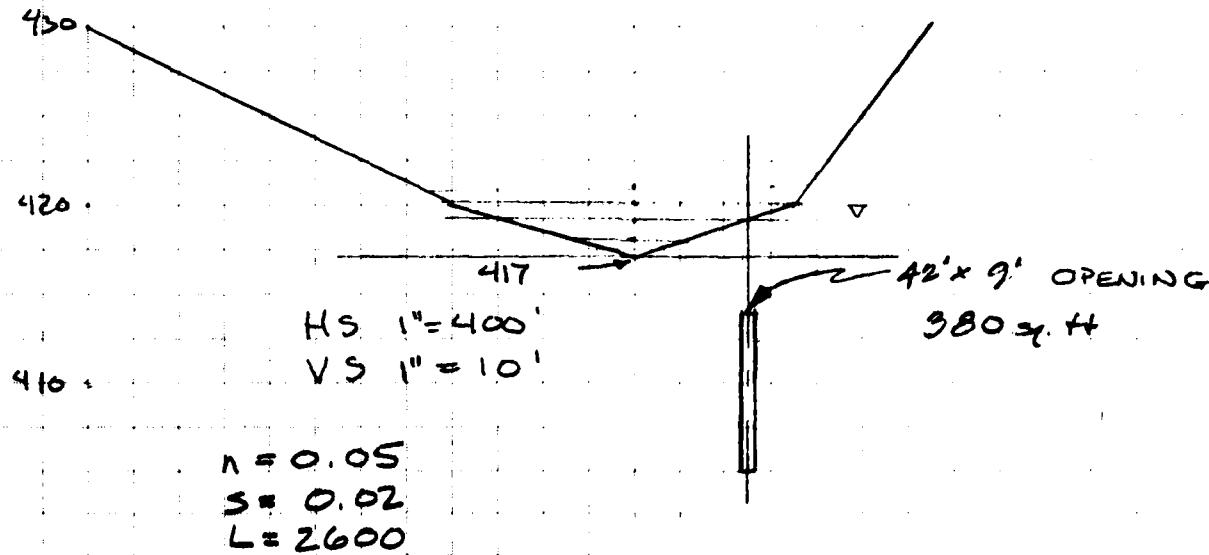
$$V_9 (\text{TRIAL}) = 22 \text{ Ac ft}$$

$$Q_{P9} = 7092 \text{ cfs} \quad H_9 = 8.8 \text{ ft}$$

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JOB HALCHEK HOND DAM
 SHEET NO. 18 OF 19
 CALCULATED BY MR DATE 2/13/81
 CHECKED BY K. A. DATE 2/12/81
 SCALE

SECTION 9 (RTE. 32) STA. 86+50



H	A	W/P	R	V	Q _a	Q _s	Q _{TOT}	A _{TOT}
12'	—	—	—	—	—	4225	4225	506
13	120	240	0.5	2.7	324	4880	5204	626
14	520	520	1.0	4.2	2184	5460	7644	1026
15	1125	750	1.5	5.5	6137	5980	12167	1631
16	1640	820	2.0	6.7	10,988	6450	17,438	2146

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JOB HALCHER END DAM
SHEET NO. 19 OF 19
CALCULATED BY M.R. DATE 2/3/81
CHECKED BY K.A. DATE 2/12/81
SCALE _____

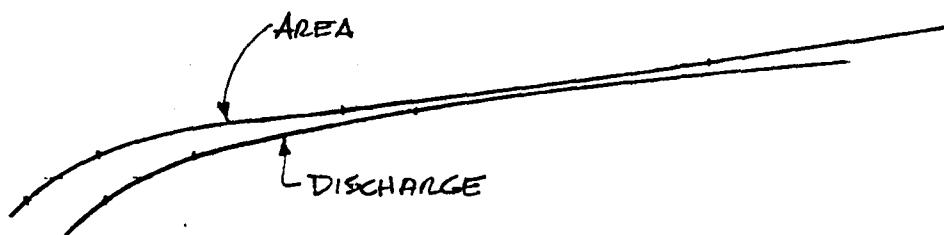
SECTION 9

DISCHARGE (1000 cfs)

2 4 6 8 10 12

18
16
14
12
10

H



3 6 9 12 15

AREA (100 sq ft)

$$Q_{p9} = 7092 \text{ cfs}$$

$$Q_{p10} (\text{TRIAL}) = 4697 \text{ cfs}$$

$$H_9 = 13.8 \text{ ft}$$

$$H_{10} (\text{TRIAL}) = 12.5 \text{ ft}$$

$$A_9 = 875 \text{ sq ft}$$

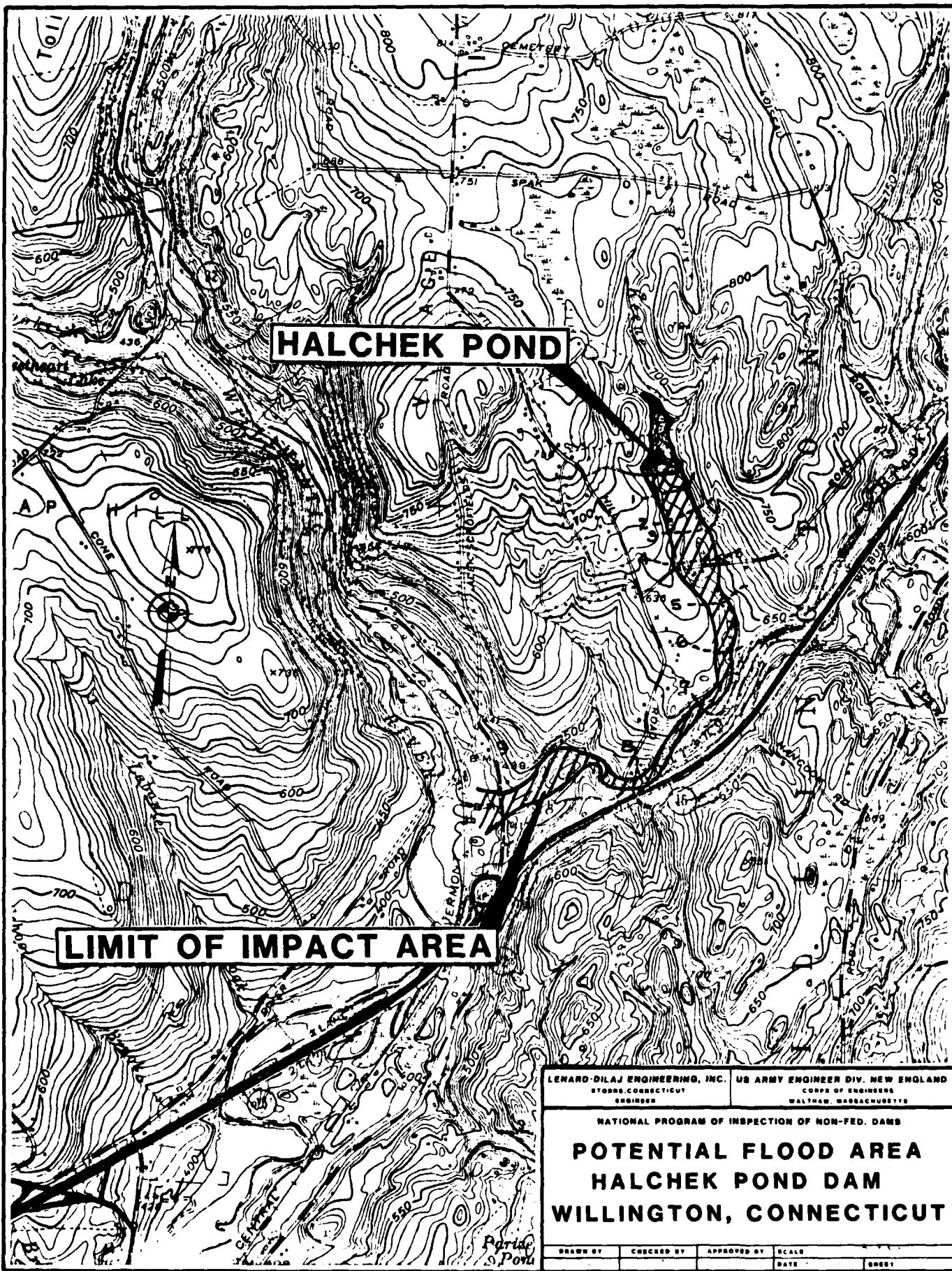
$$A_{10} (\text{TRIAL}) = 550 \text{ sq ft}$$

$$V_9 = 52 \text{ Ac ft}$$

$$V_{10} (\text{TRIAL}) = 33 \text{ Ac ft}$$

$$Q_{p10} = 5135 \text{ cfs} \quad H_{10} = 12.8 \text{ ft}^*$$

* 0.8 FT. ABOVE ROAD LEVEL



APPENDIX E

**INFORMATION AS CONTAINED IN THE
NATIONAL INVENTORY OF DAMS**

INVENTORY OF DAMS IN THE UNITED STATES

CITY STATE COUNTY DIST.	CITY STATE COUNTY DIST.	NAME	CONC NAME	REPORT DATE	(1)		(2)		(3)		(4)		(5)		(6)		(7)						
					(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)		
01 10 CLEENE BROOK	01 10 CLEENE BROOK	MALCHEK POND DAM	MALCHEK POND	11DEC60																			
(1) POPULAR NAME				(2) NAME OF IMPOUNDMENT				(3) NEAREST DOWNSTREAM CITY-TOWN-VILLAGE				(4) DIST FROM DAM (M.I.)				(5) POPULATION							
								WILLINGTON				1				4300							
(6) RIVER OR STREAM				(7) NEAREST DOWNSTREAM CITY-TOWN-VILLAGE				(8) IMPOUNDING CAPACITIES				(9) DIST OAN FED R PRV/FED SCS A VER/DATE				(10)							
KLEENE BROOK								MAXIMUM HYDRAULIC HEAD				154				81				NED N N N N			
(11) TYPE OF DAM				(12) YEAR COMPLETED				(13) SURFACE AREA				(14) MAXIMUM VOLUME				(15) NAVIGATION LOCKS				(16)			
M				1972				29				45800				NOT ENOUGH INFORMATION				NOT ENOUGH INFORMATION			
(17) SPILLWAY				(18) OWNER				(19) ENGINEERING BY				(20) CONSTRUCTION BY				(21) MAINTENANCE				(22)			
CONCRETE SPILLWAY				JOSEPH HALCHEK				STANLEY L ALLEN PE				JOSEPH HALCHEK				CT DEP				CT DEP			
(23) DESIGN				(24) CONSTRUCTION				(25) OPERATION				(26) MAINTENANCE				(27)				(28)			
CT DEP				CT DEP				CT DEP				CT DEP				CT DEP				CT DEP			
(29) INSPECTION BY				(30) INSPECTION DATE				(31) AUTHORITY FOR INSPECTION				(32)				(33)				(34)			
LENARD & DILAJ ENGINEERING INC				11DEC80				PL 92-367															
(35)				(36)				(37)				(38)				(39)				(40)			
SPILLWAY SPILLWAY SOFT WIDE CAPACITY 315 CFS 31-BBOX CULVERT 2x2																							
(41)				(42)				(43)				(44)				(45)				(46)			

END

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